NOTICE

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<th>MEANING</th>
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<tr>
<td>A/C</td>
<td>Aircraft</td>
</tr>
<tr>
<td>AMC</td>
<td>Acceptable Means of Compliance</td>
</tr>
<tr>
<td>ANC</td>
<td>Air Navigation Commission</td>
</tr>
<tr>
<td>APT</td>
<td>Airbus Pilot Training</td>
</tr>
<tr>
<td>ATC</td>
<td>Air Traffic Control</td>
</tr>
<tr>
<td>ATO</td>
<td>Approved Training Organization</td>
</tr>
<tr>
<td>ATPL</td>
<td>Airline Transport Pilots License</td>
</tr>
<tr>
<td>ATSAS</td>
<td>Aircrew Training Standards &amp; Safety</td>
</tr>
<tr>
<td>BT</td>
<td>Base Training = LT (Landing Training)</td>
</tr>
<tr>
<td>CBT</td>
<td>Competency-based training</td>
</tr>
<tr>
<td>CBT</td>
<td>Computer based training</td>
</tr>
<tr>
<td>CCQ</td>
<td>Cross-Crew Qualification – Airbus</td>
</tr>
<tr>
<td>Competency</td>
<td>The combination of KSAs required to perform a task to prescribed standards under certain conditions (ICAO)</td>
</tr>
<tr>
<td>Conversion</td>
<td>Type Transition</td>
</tr>
<tr>
<td>CPL</td>
<td>Commercial Pilots License</td>
</tr>
<tr>
<td>CRM</td>
<td>Crew Resource Management</td>
</tr>
<tr>
<td>Cueing</td>
<td>Provision of sensory perception in simulation</td>
</tr>
<tr>
<td>Differences</td>
<td>Training between variants of the same type</td>
</tr>
<tr>
<td>EASA</td>
<td>European Aviation Safety Agency</td>
</tr>
<tr>
<td>EBT</td>
<td>Evidence Based Training (ITQI)</td>
</tr>
<tr>
<td>EDTO</td>
<td>Extended Diversion Time Operations (ETOPS)</td>
</tr>
<tr>
<td>ELT</td>
<td>English Language Training</td>
</tr>
<tr>
<td>ELT</td>
<td>Entry Level Training</td>
</tr>
<tr>
<td>FAA</td>
<td>US Federal Aviation Agency</td>
</tr>
<tr>
<td>FAQ</td>
<td>Frequently Asked Questions</td>
</tr>
<tr>
<td>FAR pt 141</td>
<td>FAA Training Regulations</td>
</tr>
<tr>
<td>FAR pt 142</td>
<td>FAA FTO regulations</td>
</tr>
<tr>
<td>FCLT</td>
<td>Flight Crew Licensing – Training</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
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<tr>
<td>FCLTP</td>
<td>Flight Crew Licensing Training Panel (ICAO)</td>
</tr>
<tr>
<td>FI</td>
<td>Flight Instructor (aircraft)</td>
</tr>
<tr>
<td>Fidelity</td>
<td>Realism in simulation</td>
</tr>
<tr>
<td>FMS</td>
<td>Flight Management System</td>
</tr>
<tr>
<td>FNPT II</td>
<td>Flight Navigation Procedures Trainer II</td>
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<tr>
<td>FODA</td>
<td>Formative Observation Data Analysis</td>
</tr>
<tr>
<td>FOQA</td>
<td>Flight Operations Quality Assurance</td>
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<td>FRMS</td>
<td>Fatigue Risk Management System (ICAO)</td>
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<td>FSI</td>
<td>Flight Simulator Instructor (EASA)</td>
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<tr>
<td>FSTD</td>
<td>Flight Simulation Training Device (ICAO)</td>
</tr>
<tr>
<td>FTO</td>
<td>Flight Training Organization</td>
</tr>
<tr>
<td>GA</td>
<td>General Aviation</td>
</tr>
<tr>
<td>GM</td>
<td>Guidance Material</td>
</tr>
<tr>
<td>HF</td>
<td>The study of Human Factors – Man and his interaction with the world around him</td>
</tr>
<tr>
<td>HoT</td>
<td>Head of Training</td>
</tr>
<tr>
<td>IATA</td>
<td>International Air Transport Association</td>
</tr>
<tr>
<td>ICAO</td>
<td>International Civil Aviation Organization</td>
</tr>
<tr>
<td>ICAO 9625</td>
<td>Manual for the Qualification of FSTDs</td>
</tr>
<tr>
<td>ICAO 9868</td>
<td>Training Guidelines for MPL and other pilot licenses</td>
</tr>
<tr>
<td>ICATEE</td>
<td>International Committee for Aviation Training in Extended Envelopes (ICAO/RAeS IWG)</td>
</tr>
<tr>
<td>IEM</td>
<td>Interpretive and Explanatory Material (IOSA)</td>
</tr>
<tr>
<td>IQ</td>
<td>Instructor Qualification (ITQI)</td>
</tr>
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<td>IFR</td>
<td>Instrument Flight Rules</td>
</tr>
<tr>
<td>IOE</td>
<td>Initial Operating Experience</td>
</tr>
<tr>
<td>IOS</td>
<td>Instructor Operating Station (FSTD)</td>
</tr>
<tr>
<td>IOSA</td>
<td>IATA Operational Safety Audit</td>
</tr>
<tr>
<td>IPPTG</td>
<td>International Professional Flight Training Group (EASA)</td>
</tr>
<tr>
<td>IR</td>
<td>Instrument Rating</td>
</tr>
<tr>
<td>IRM</td>
<td>Intuitive Risk Matrix (ITQI)</td>
</tr>
<tr>
<td>ISD</td>
<td>Instructional System Design</td>
</tr>
<tr>
<td>ISM</td>
<td>IOSA Standards Manual</td>
</tr>
<tr>
<td>Term</td>
<td>Description</td>
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<td>-----------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>I-STARS</td>
<td>Integrated Safety Trend Analysis &amp; reporting System (ICAO)</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>ITQI</td>
<td>IATA Training Qualification Initiative (PAT, EBT, IQ, MPL, FSTD, E&amp;M)</td>
</tr>
<tr>
<td>IUAI</td>
<td>International Union of Aerospace Insurers</td>
</tr>
<tr>
<td>IWG</td>
<td>International Working Group (may be appointed by ICAO)</td>
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<tr>
<td>JAA</td>
<td>Joint Airworthiness Authority (Europe, pre-EASA)</td>
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<tr>
<td>JAR-FCL</td>
<td>Joint Airworthiness Regulations (JAR) – Flight Crew Licensing</td>
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<td>JAR-STD</td>
<td>Joint Airworthiness Regulations (JAR) – Synthetic Training Devices (FSTDs)</td>
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<tr>
<td>JAR-STD 1a</td>
<td>JARs for aeroplane flight simulators (TRTOs)</td>
</tr>
<tr>
<td>KSAs:</td>
<td>Knowledge, Skills and Attitudes</td>
</tr>
<tr>
<td>KSAs:</td>
<td>NINE TERMINAL ELEMENTS</td>
</tr>
<tr>
<td>COM</td>
<td>Demonstrate communication</td>
</tr>
<tr>
<td>MAC</td>
<td>Demonstrate manual aircraft control</td>
</tr>
<tr>
<td>SAW</td>
<td>Demonstrate situational awareness</td>
</tr>
<tr>
<td>LTW</td>
<td>Demonstrate leadership and teamwork</td>
</tr>
<tr>
<td>FMG</td>
<td>Demonstrate flight management, guidance and automation</td>
</tr>
<tr>
<td>APK</td>
<td>Demonstrate application of procedures and knowledge</td>
</tr>
<tr>
<td>KNO</td>
<td>Demonstrate aeronautical knowledge</td>
</tr>
<tr>
<td>WLM</td>
<td>Demonstrate workload management</td>
</tr>
<tr>
<td>PSD</td>
<td>Demonstrate problem solving and decision making</td>
</tr>
<tr>
<td>LM2</td>
<td>Improved Lateral Motion Algorithm (FSTD)</td>
</tr>
<tr>
<td>LOC</td>
<td>Loss of Control</td>
</tr>
<tr>
<td>LOE</td>
<td>Line Operational Experience</td>
</tr>
<tr>
<td>LOFT</td>
<td>Line Oriented Flight Training</td>
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<tr>
<td>LOS</td>
<td>Line Operational Simulation</td>
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<td>Line Operational Safety Audit (ICAO Doc 9803)</td>
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<td>LSK</td>
<td>Licensing Skill Test – EASA</td>
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<td>LT</td>
<td>Landing Training (Base)</td>
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<tr>
<td>MCC</td>
<td>Multi-Crew-Cooperation (Euro-CRM)</td>
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<tr>
<td>MFF</td>
<td>Mixed Fleet Flying (Airbus)</td>
</tr>
<tr>
<td>MPA</td>
<td>Multi-Crew Aeroplane (MPL)</td>
</tr>
<tr>
<td>MPL</td>
<td>Multi-Crew Pilots License (ICAO Doc 9868)</td>
</tr>
<tr>
<td><strong>Guidance Material and Best Practices for MPL Implementation</strong></td>
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<td>---------------------------------------------------------------</td>
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<tr>
<td>MPL Phase 1</td>
<td>Core Phase</td>
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<td>MPL Phase 2</td>
<td>Basic Phase</td>
</tr>
<tr>
<td>MPL Phase 3</td>
<td>Intermediate Phase</td>
</tr>
<tr>
<td>MPL Phase 4</td>
<td>Advanced Phase</td>
</tr>
<tr>
<td>NAA</td>
<td>National Aviation Authority</td>
</tr>
<tr>
<td>NASA</td>
<td>National Aeronautics and Space Administration</td>
</tr>
<tr>
<td>NGAP</td>
<td>ICAO Next Generation Aviation Professionals</td>
</tr>
<tr>
<td>NPA</td>
<td>Notice of Proposed Amendment (EASA)</td>
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<td>NPRM</td>
<td>Notice of Proposed Rule Making (FAA)</td>
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<tr>
<td>PANS</td>
<td>Procedures for Air Navigation Services</td>
</tr>
<tr>
<td>PAT</td>
<td>Pilot Aptitude Testing (ITQI)</td>
</tr>
<tr>
<td>PC</td>
<td>Personal Computer</td>
</tr>
<tr>
<td>PELT</td>
<td>Pilot Licensing and Training</td>
</tr>
<tr>
<td>PF</td>
<td>Pilot Flying</td>
</tr>
<tr>
<td>PIC</td>
<td>Pilot in Command</td>
</tr>
<tr>
<td>PM</td>
<td>Pilot Monitoring (PNF)</td>
</tr>
<tr>
<td>PNF</td>
<td>Pilot Not Flying (former term)</td>
</tr>
<tr>
<td>PPL</td>
<td>Private Pilots License</td>
</tr>
<tr>
<td>Q&amp;A</td>
<td>Question and Answers</td>
</tr>
<tr>
<td>QAR</td>
<td>Quick Access Recorder</td>
</tr>
<tr>
<td>RAeS</td>
<td>Royal Aeronautical Society</td>
</tr>
<tr>
<td>SARPS</td>
<td>Standard and Recommended Practices (ICAO)</td>
</tr>
<tr>
<td>SE (A)</td>
<td>Single Engine Aircraft</td>
</tr>
<tr>
<td>SEP</td>
<td>Safety Emergency Procedures</td>
</tr>
<tr>
<td>SFI</td>
<td>Synthetic Flight Instructor (EASA Term)</td>
</tr>
<tr>
<td>SMS /SMM</td>
<td>Safety Management System (ICAO Doc 9859)</td>
</tr>
<tr>
<td>SOP</td>
<td>Standard Operation Procedure</td>
</tr>
<tr>
<td>SR</td>
<td>Speech Recognition</td>
</tr>
<tr>
<td>STEADES</td>
<td>IATA Safety Trend Evaluation, Analysis and Data Exchange System</td>
</tr>
<tr>
<td>TE (A)</td>
<td>Twin Engine Aircraft</td>
</tr>
<tr>
<td>TEM</td>
<td>Threat &amp; Error Management (ICAO Doc 9803)</td>
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<tr>
<td>TR</td>
<td>Type Rating</td>
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<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>TRE</td>
<td>Type Rating Examiner (EASA)</td>
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<tr>
<td>TRG</td>
<td>Training</td>
</tr>
<tr>
<td>TRI</td>
<td>Type Rating Instructor (EASA)</td>
</tr>
<tr>
<td>TRTO</td>
<td>Type Rating Training Organization (EASA)</td>
</tr>
<tr>
<td>UPRT</td>
<td>Upset Prevention and Recovery Training (formerly URT)</td>
</tr>
<tr>
<td>VFR</td>
<td>Visual Flight Rules</td>
</tr>
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</table>
FOREWORD

It is my pleasure to introduce the first edition of the IATA Guidance Material and Best Practices for MPL Implementation, as part of the IATA Training and Qualification Initiative (ITQI).

The creation of this manual was identified as one of the ITQI’s priorities to adapt pilot and maintenance personnel training and checking schemes to the needs of modern multi-crew operation.

Together with the IATA Guidance Material and Best Practices for Pilot Aptitude Testing, which was published in the summer of 2009 and the ICAO Guidance Material on Evidence Based Training (EBT) and on Instructor Qualification which is under development by an ITQI Working Group and expected to be published end of 2011, it constitutes IATA’s Total Systems Approach to improve operational safety in civil aviation.

This Guidance Material covers all aspects necessary to understand, construct and run a successful MPL course.

I would like to thank the members of the ITQI MPL Implementation Project Group, the Training Organizations and the Airlines that have contributed to the development of this material.

To obtain more information about ITQI, please consult our website at: www.iata.org/itqi.

Guenther Matschnigg
Senior Vice President
Safety, Operations and Infrastructure
PREAMBLE – THE CHALLENGES

Experience loss

The combined challenges are serious:

EXPERIENCE LOSS + DOUBLING OF FLEET + LESS CAREER INTEREST

One countermeasure: Quality and relevance to ab-initio airline pilot training.
MPL IMPLEMENTATION GUIDANCE NOTES

Manual Objective
This document sets out to consolidate MPL guidance material available to date into one manual in support of accelerated understanding, adoption, and implementation of MPL. It is hoped that the contents will be useful to the following entities:

1. National Aviation Authorities (NAAs)
2. Airline managements (executive and operational)
3. Pilot Representative Bodies
4. Training Organization management
5. MPL course developers
6. Young people interested to become airline pilots
7. Other interested parties

Manual Content
The material in this manual is based on:

1. ICAO Annex 1, doc 9868
2. Rationales derived from the MPL research and development process (64 participants of the ICAO Flight Crew Licensing and Training Panel [FCLTP] during MPL development (2002 to 2005 – members and observers nominated by 18 Contracting States and five international organizations)
3. Other material in support of MPL, including EASA MPL requirements

Manual Structure
The manual is structured as close to a logical sequence as possible (preparatory information, crew aptitude testing, then training by MPL phase). The bulk of early sections in the manual (1 – 15) provide general preparatory guidance. Section 16 provides specific guidance by phase of MPL; Appendices provide information from courses run to date, and Attachments provide useful reference material.

For reader’s intent on a quick search, the FAQ section at the end of this document may provide the answer.

Terminology used
EASA has developed the ICAO MPL significantly, and there are many references in this manual to EASA MPL requirements. Nevertheless an attempt has been made throughout to use ICAO terminology wherever possible. As the industry develops, new and different terminologies emerge leading to multiple terms with the same meaning. The glossary of terms at the front of this manual provides a cross-reference of terms which should provide clarity of meaning in all regions of airline activity. Illustrative examples:
SFI: Synthetic Flight Instructor (under EASA) = FSI: Flight Simulator Instructor or similar in other regions.

PM: Pilot Monitoring has been seen in recent years as a more appropriate descriptor than PNF (Pilot Not Flying) and adopted for some time by Airbus and Boeing. As a result, many operators already use this term (PM) in their operations manuals.

Data Sources for Manual

Data supporting this manual is derived primarily from MPL courses in operation or planned between November 2006 (MPL introduction) and December 2010 (the effective date of the major portion of information provided in this manual). Data used to develop this Guidance Material stems from:

- 14 ATOs which globally conduct MPL courses so far by personal and telephone interviews and e-mail correspondence and structured questionnaires (Attachment 2 – Survey on the characteristics of existing MPL courses, Sample)
- Operators which cooperate with the ATOs and which employed/will employ the successful MPL graduates
- Insights collected from the EASA and Transport Canada MPL Advisory Boards
- Results of an EASA MPL survey among the European National Authorities
- Personal discussions/interviews and e-mail correspondence with individual instructors engaged in the MPL training and testing process
- Personal discussions/interviews and e-mail correspondence with MPL students/graduates in different stages of training
- Discussions, personally or by e-mail, with National Aviation Authorities’ representatives engaged in Pilot licensing, training and testing and school approval
- Participation in Pilot Training – Conferences, – Workshops and – Panels

Data Sample Size and early publication of Manual

Although the data collected from MPL courses running up to December 2010 is quite small (approximately 1,100 MPL students enrolled and 280 MPL students graduated), when combined with general program feedback, the initial output is sufficient to enable this first edition of Guidance Material to be published. There are three compelling reasons why this is done now:

1. The urgency of improved airline pilot training: The global civil aviation training community now accepts that the traditional, inventory and hours-based training regulations for ab-initio pilot training are out of step with the requirements of multi-crew operation in modern transport airplanes, and that crew training has become a prime target to generate improvements in safety
2. The availability of better practice: The competency-based training approach will yield higher quality graduates more efficiently
3. The avoidance of misunderstanding: For much of the airline training industry, competency-based training is a seismic shift in approach for training professionals. It is important that the concept is understood well to prevent misuse at the earliest stage.
Guidance Material and Best Practices for MPL Implementation

Caveats

**Gender:** Any reference to male gender in this manual is intended to mean both male and female.

**References:** Although the content of this manual is referenced to official ICAO, EASA, and IATA documents, the reader should recognize that these documents take priority over the content of this manual; some of which is inevitably interpretive.

**Dominant references:** For each National Aviation Authority, the ICAO framework provided by documents 9868 and 9625 remain dominant references.

Manual Updates

MPL requires a new training process which is evolving as a result of continuous feedback (the ICAO prescribed on-going evaluation of MPL). IATA commits to manual updates on a regular basis, especially when significant change occurs. In this context it should be noted that the course structures described in the Appendices are likely to be subject to substantial change.
SECTION 1
GENERAL GUIDANCE – THE HISTORY OF MPL

Legacy process
Since 1947 traditional training for airline pilots has followed a prescriptive compartmentalized (box ticking) process along the following lines:

1. Ab-initio training in light propeller SE and TE aircraft *(normally delivered by instructors without airline experience – and sometimes motivated to build own hours)*, graduating to a Commercial Pilots License
2. Accumulation of applicable flight experience (in countries with a ready-entry career structure such as the USA)
3. Airline jet upgrade
4. Airline type transition
5. Base training (Landing Training – LT) and line operational experience (LOE)

Training needs have markedly changed and future threats are more visible

- **Human factors** remain the most significant cause in accidents and incidents; humans in the safety system have become the weakest link
- **The hardware improvement plateau?** Hardware has improved significantly, but the opportunity to further develop technology in any short time frame is limited; there is no sign yet of 5th generation airliners
- **Expansion and Safety:** The airline industry faces multiple challenges during expansion, most significantly the prospect of more accidents if the accident rate cannot be reduced further
- **More training?** Additional training volume would be a major cost challenge for the industry at this time
- **Quality and relevance.** Fresh strategies are needed now to improve the quality and relevance of airline pilot selection and training. Pilot Aptitude Testing or PAT, and MPL training have now become vital to airline industry safety objectives, in a climate where piloting careers are becoming less attractive to young people.
- **Holistic approach.** As part of a “total systems approach”, IATA is encouraging the adoption of MPL training as an important component of safety strategy
- **Outdated process.** Over the past decades ICAO training and licensing standards have remained relatively unchanged, and have become exposed as obstacles to the application of industry best practice. Modern course development tools such as Instructional System Design (ISD) were not sufficiently utilized by the airline training industry, or supported by regulators.
- **Updated training tools.** FSTD technology has been revolutionized but could not be used to its full extent
Less-relevant legacy training  Traditional ab-initio training developed skills which were in a large part not relevant to the operation of modern multi-crew transport category airplanes. Light training airplanes had little in common with airliners in service, promoting some negative training, and future risk. Although crew coordination / crew resource management were important training objectives, for the last three decades we have trained airline pilots in single pilot airplanes with substantially limited crew coordination training capability.

Recognition of new training needs

There has been a developing awareness that new actions are needed in training:

- to transfer appropriate Knowledge Skills and Attitudes (KSAs) for safe, effective and efficient multi-crew flight operations to students much earlier in the ab-initio training process
- to re-engineer ab-initio training based on a cognitive task analysis of operational expert behavior
- to gain credit for the use of advanced synthetic training tools of all levels of fidelity (FSTD)
- to focus on the development of multi-crew operation competencies instead of single engine PIC flying
- at an earlier stage of the training process
- to develop strategic thinking and decision making in parallel with technical knowledge and skills

Earlier attempt at MPL

The need to update airline pilot training was recognized as early as the 80s. The first ICAO attempt to adapt to changes in the airline industry was the installation of the Pilot Licensing and Training (PELT) Panel from 1982-1986, which failed. The encouraging final proposal could not find the necessary support from the Air Navigation Commission (ANC) and the ICAO Council.

Most recent action – the birth of MPL

The second approach commenced in October 2000 in Madrid, and led to the installation of the ICAO Flight Crew Licensing and Training Panel (FCLTP) from 2002-2005. The FCLTP had 64 participants, including members and observers nominated by eighteen Contracting States and five international organizations. The ANC adopted the results and the new Annex 1 containing the MPL in Chapter 2.5 and PANS-TRG were distributed in November 2006. The transposition into the JARs went in parallel, and in December 2006 the new JAR-FCL Amendment # 7 including MPL was distributed. Transposition into EASA Part FCL is underway and expected to be completed during 2011.

Reasons for subsequent slow adoption of MPL

By the end of 2010, 30 States had adopted MPL regulations and in 12 states MPL courses were being conducted. Since ICAO doc 9868 was published in 2006, it is disappointing that only 7% of the 190 ICAO Contracting States have approved Training Organizations to conduct MPL. Some factors which may help to explain the slow implementation rate of MPL:
General Resistors to MPL

Regulatory inertia (regulators): One objective for National Authorities is to guard and protect existing regulations. It is inevitable that for local authorities, regulatory change may be uncomfortable, and some reluctance may be seen despite safety dividends sought by ICAO.

Natural change resistance (operators): Its new, yet current training process seems to work; conservatism; too busy to peer into the future despite numerous safety warning bells.

False perception regarding MPL origin: Widespread early beliefs that MPL was designed to address rapid growth; accelerating pilot delivery to airlines by reducing training time; now discredited with facts.

Reluctance from candidates: MPL is a dedicated airline license, which does not permit pilots to fly in other areas of aviation without additional training, reducing career options on graduation. [ICAO Annex 1 recognizes this and solutions are available].

Lower exposure to hours of flight in light aircraft: MPL deliberately reduces exposure to non-relevant single pilot propeller aircraft, except for vital training objectives, and this has been seen by traditionalists as a serious limitation of MPL, until the whole program is properly understood.

[NB. Regarding the value of training future MPA pilots in small propeller driven, straight wing, single pilot airplanes refer to ATTACHMENT 6 – Working Paper from the ICAO Flight Crew Licensing and Training Panel (FCLTP) which in part led to the decision to substantially reduce actual flight in small single pilot airplanes and replace it with structured training in real multi-crew environments].

Financial resistors to MPL

Recession: Doc 9868 was published in 2006, just prior to “one of the deepest recessions in 50 years. This sharply diminished ATO resources available for the re-gearing needed to launch MPL.

Replacement or upgrade of legacy equipment: MPL requires more precisely dedicated training devices (FSTDs) – adding initial cost for training ATOs.

More stringent instructor requirements: – adding cost for ATOs.

Training quality is seen as a low priority: amongst key operator decision makers who say: “As we meet regulatory requirements, why should we add more training?”
Likely development

With more understanding of MPL a new climate will emerge more supportive of this new license. We already saw an increase in quarter two of 2011, ultimately leading to MPL training as the primary ab-initio route to an airliner cockpit and improved safety standards (Attachment 1 – Global Status of MPL Implementation – provides additional information regarding existing MPL course approvals and a global MPL course comparison).

ICAO MPL provides a relevant new requirement framework, but work is still needed to put the "meat on the bone"

CHALLENGES & RESPONSES

| Selection significant improvement is possible | Human factors (in Multi-Crew settings) still a significant factor in accidents | Improved instruction FTOs are used by instructor pilots to gain hours | Airline handling Skills weaken as automation takes over | Loss of Control has become a significant accident cause | ATC Coms are an ongoing safety issue |

MPL TRAINING FRAMEWORK REQUIRES QUALITY AND RELEVANCE IN AIRLINE PILOT TRAINING

<table>
<thead>
<tr>
<th>A thorough selection process</th>
<th>Embedded TEM, CRM, MCC</th>
<th>Higher quality &amp; relevance of instruction</th>
<th>Continuous competency assessment</th>
<th>Upset Recovery Training (URT)</th>
<th>ATC Training (ATC system simulation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not a CPL requirement</td>
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<td>Not a CPL requirement</td>
<td>Not a CPL requirement</td>
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The CPL paradigm needs updating

MPL – CPL:
SECTION 2
GENERAL GUIDANCE – THE ADVANTAGES OF THE MPL

Multi-Crew Focus
MPL is a state of the art ab-initio airline pilot training program, seamlessly integrated with an airline type rating, with continuous multi-crew focus. The objective is to “begin with the end in mind” (the qualified airline First Officer – operations-ready).

A dynamic process
MPL training is dynamic, rather than hours-prescriptive (the traditional CPL training approach). MPL recognizes that flying hours in isolation are experienced and applied in many ways, and are not a valid measure of competency.

Flexibility and performance-base design
MPL is a more flexible framework designed to respond to industry performance feedback through a philosophy of continuous improvement. This is a major advantage of MPL training, driven by continuous assessment of student performance.

Removal of legacy regulatory hurdles
MPL removes forty year old prescriptive / hours based regulatory obstacles and enables best industry practice to be applied through modern Instructional System Design (ISD).

Variability of early courses
It will be seen from the Appendices that current MPL courses are of variable lengths, some shorter and some longer than existing programs. Early courses are unlikely to be less expensive, and may indeed be slightly more expensive than traditional training as the re-engineering of training resources occurs. Convergence in program optimization and standardization will occur as experience is gained.

Competencies of the airline pilot’s job
MPL is based on training to the core competencies required to operate modern jet transport aeroplanes.

Longer term cost savings
The underlying intent is for the MPL graduate to have been provided with higher quality, more relevant training for airline operations. This will eventually translate into more operational safety, ultimately measurable as cost savings.
Embedded human factor skill training
The majority of incidents and accidents in civil aviation are still caused by human factors such as a lack of interpersonal skills (communication, leadership and teamwork), workload management, situational awareness, and structured decision making. MPL requires full-time embedded (rather than add-on) Crew Resource Management (CRM) and Threat and Error Management (TEM) training.

New Training Tools
MPL applies training device criteria which has been driven by training objectives (rather than the other way around) via the latest developments in Flight Simulation Training Devices (FSTD) qualification criteria (ICAO Doc 9625, published in 2009, as a result of many years of international re-development).

ATC system
To address ongoing safety threats from poor ATC communications, MPL requires the use of a modern simulated ATC system in FSTDs, ultimately automated using speech recognition technology (See Section 15).

Upset Prevention and Recovery Training (UPRT) and Automation Management
To address on-going LOC (loss of control) threats in airline operations, MPL mandates that upset prevention and recovery training (UPRT) in both aircraft and FSTDs, is delivered by appropriately qualified instructors. MPL also considers and accommodates threats inherent from increased automation and reduced manual flying.

What MPL will deliver
Through the obvious improvement of the training quality and relevance, safer airline pilots from the start of their careers. More optimized training promises to save training costs, and safer pilots will become a measurable cost saving over time.

What MPL will NOT deliver
Early MPL courses will not ‘necessarily’ deliver a cheaper or faster program for airline pilot entry, especially during the introductory years.

[Although exposure in MPL is reduced to less relevant flight training in light aircraft, MPL programs apply more FSTD and total instructional hours than an average CPL course. MPL is not revolutionary; it utilizes training processes established in the military for many decades.]
Airline pilot IOE performance against light aircraft flight experience

An analysis follows which compared line performance during IOE against light aircraft hours. No correlation was found between more hours and improved performance.

Analysis of cadet entry performance on the line from a respected airline in Asia:

Summary of the advantages of MPL training

MPL focuses on ab-initio training for the airline pilot, and is:

- determinedly designed for airline operations, with quality, relevance, and safety in mind
- dynamic rather than hours-prescriptive
- competency-based, using KSAs established through task analysis, and applied through instructional design
- a set of modern airline training requirements which include:
  - Greater emphasis on flight simulation than light training aircraft
  - Embedded CRM/multi-crew concept and TEM throughout (safety dividend)
  - Mandatory upset recovery training in aircraft (safety dividend)
  - Simulated ATC environment in FSTD training (safety dividend)

Most features of MPL above were not basic requirements of the 1947 CPL.
SECTION 3
GENERAL GUIDANCE – GLOBAL RESULTS SUMMARY (UNWEIGHTED)

From early MPL Courses
The information in this paragraph is inventory-based and un-weighted. It does not state to what extent the philosophy of competency-based training is met. It has to be emphasized from the outset that course length and number of training hours are not meaningful criteria to measure the quality or the success of a competency-based training scheme.

Up to December 2010 a total of 14 Approved Training Organizations (ATO) have conducted or were conducting MPL courses. Three are operator owned, 10 are training providers which have a contractual agreement with an associated operator, and 1 started as a stand-alone training provider.

Number of students
Approximately 1,100+ students are enrolled, 280+ have graduated 180 of which have successfully completed the IOE phase and are acting as First Officers, mostly on A 320 family airplane. During 2011 the enrolment of another 600 students and the check-out of another 400 graduates can be expected.

Course length
Course length ranges from 14 to 36 months; the average is 21.5 months.

Total hours flying training
Total Flying Training (aeroplane + simulator) ranges from 248 – 404 hrs, the average is 286 hrs.

Training time in simulators
Simulator hours range from 155 – 292 hrs, the average is 196 hrs.

Training time in aeroplane
Aeroplane hours range from 70 – 112 hrs, the average is 90 hrs.
Solo-time is included and ranges from 10 – 30 hrs; the average solo-time is 18.5 hrs.

Types of aeroplane
5 ATOs use single engine aeroplane (SE) only;
7 use SE + Twin engine aeroplane (TE);
2 use SE + Jet aeroplane.
Aeroplane versus Phases

7 ATOs use aeroplane only in Phase 1;

7 ATOs use aeroplane in Phase 1 and Phase 2, 2 of them use Jet a/c in Phase 2.

Actual Landings in Multi-Pilot Aeroplane (MPA)

1 Regulator requires **20 landings**, 12 Regulators require a minimum of **12 landings** on the MPA type and;

1 Regulator allows for a reduction to **6 landings**.

*Further detailed descriptions of the course structures are provided in the Appendices.*
SECTION 4
GENERAL GUIDANCE – COOPERATION BETWEEN OPERATOR, ATO, AND NATIONAL LICENSING AUTHORITY

Early assumption
During development of the MPL there was an initial assumption that MPL courses would mainly be of interest to well-established operators, which run their own in-house flying schools. This assumption has been reviewed for several reasons.

Outsourced ATOs
Many operators have traditionally outsourced their cadet training, mainly for economic reasons, to Approved Training Organizations (ATOs) as third party training providers. An increasing number of independent ATOs recognize that close connections to potential employers support training quality, attract more cadets (most attractive is the inclusion of IOE), and therefore are beneficial to their business [Note: The general qualification requirements for ATOs can be found in ICAO Annex 1, Appendix 2 “Approved Training Organizations”. Further details are in ICAO Doc. 9841 “Manual on the Approval of Flight Crew Training Organizations” (See www.icao.int)].

Initial setup for MPL program
It must be considered that the initial setup of an MPL course requires a great amount of management attention and documentation. The following steps will be needed:

1. Involve the licensing authority from the outset; as subsequent steps may require their inputs
2. Set up the cooperation framework between operator and ATO
3. Establish administrative processes
4. Design or utilize a suitable document management system

Considerations with the National Authority

Preface
As EASA has progressed with MPL regulations, with parameters which often exceed those stipulated under ICAO PANS-TRG documentation, EASA requirements are frequently described in this manual. However, based on local need, it is the responsibility of a National Aviation Authority to interpret and stipulate requirements based on the ICAO document, which may follow, or differ from, the advanced EASA model.

Link between ATO and Operator
MPL regulations strongly suggest that the Approved Training Organization (ATO) and supporting operator be contractually connected (EASA PART FCL requires the MPL graduate to fly for “his/her” airline until completion of the IOE phase). Such cooperation improves the overall effectiveness of a competency-based training system and is therefore a sensible prerequisite for course approval.
Common legal structures

Some legal structures which are common:

a) The operator serves as a subcontractor for the ATO, which will contract the cadets, provide the MPL course Phases 1 to 4, and then pass them on to the operator for Landing Training (LT) and Initial Operating Experience phase (IOE). LT and IOE will be subcontracted to the operator by the ATO. The reverse arrangement is also possible.

b) The operator contracts applicants as cadets and uses the ATO as a subcontractor to provide the MPL course Phases 1 to 4. In both cases (a) and (b) above final hiring will be subject to successful completion of IOE.

Other options which may be considered:

c) The operator contracts the ATO to deliver Phases 1, 2, and 3, and the operator delivers Phase 4, LT, and IOE.

d) The operator owns and manages the complete MPL program, under its own authorizations.

Assumed responsibility / accountability

Regardless of which option is taken, one single point of responsibility is assigned towards the Authority for the entire course. This is normally the Head of Training (HoT) of the ATO.

Specific Issues

1. Landing (Base) Training

Under some National Regulators, Landing (Base) Training (LT) on a MPA (Multi-Pilot Aeroplane) can only be performed by a licensed crew. For this reason MPL cadets may be expected to possess a document or license which entitles them to receive landing training (LT) with a TRI. Options to consider with the regulator may include:

a) As a legacy process, some Regulators accept PPL as ‘legal documentation’ to permit airliner LT. MPL students could be issued with a PPL during the course to permit LT, and serve past regulation. [But the logic of applying a PPL to LT may require review. Under ICAO MPL a PPL is not required, and interferes with the MPL syllabus].

b) The regulator may grant a local exemption from ‘licensing’ for LT as the MPL is a fully integrated program, aimed at airliner competencies

c) The Regulator may decide to issue a restricted MPL after successful completion of initial phases of MPL (similar to the traditional CPL scenario, where the CPL comes before the airline type transition, LT, and IOE)

d) The use of a Type Rating Instructor (TRI) with Flight Instructor (FI) Qualification for LT
2. License prior to commercial operations (LOE)

A license is required before commencement of IOE in commercial operations. The authority may issue an MPL with a restriction (only valid for flights with XYZ-Operators) until the end of the IOE phase. Under EASA, after successful completion of IOE, the restriction will be removed upon application. Although the license holder is legally responsible to apply for the cancellation of the restriction it is advisable that the operator facilitate this as a special service for the employee.

3. Twin Rating, Instrument Rating, light Jet training

Some regulators may not initially appreciate that in MPL training, the MPA (Multi-Crew Aircraft) FSTD is the primary training platform for the multi-engine and instrument qualifications, and that MPL training is designed to minimize student exposure to non-relevant training aircraft types, except where necessary (e.g. UPRT). MPL allows for actual flight training in one single engine (SE) training aircraft type, with the Instrument and Twin ratings conducted on the FSTD relevant to the MPA type on the MPL license. More ‘conversions’ within the MPL course to non-airline training types may compromise MPL training philosophy and objectives (if only SE training aircraft are used, a legacy ATO may find that existing training fleets become partially surplus to requirements. However, for the purist MPL, the fleet should be re-tooled for the new task).

4. Low Visibility Training

Most operators wish to perform Low Visibility Simulator Training during the latter part of the Advanced MPL Phase (Type Rating Training) and before starting IOE. It may be necessary to clarify with the National Authority which instructors may deliver this module.

5. Less attractive license

Some reticence exists amongst prospective pilots to train for MPL because it reduces flexibility should an airline job be lost before LT and IOE are completed and the requisite hours gained for CPL ‘conversion’. Under EASA, if a cadet fails IOE the complete MPL course is considered failed, and the (restricted) license becomes useless for the cadet and may ultimately be withdrawn by the authority. In non-EASA cases the same potential problem could arise at the end of the MPL Advanced phase. Likewise, MPL cadets in training are still cautious regarding the pros and cons of their new license and wish to hold an unrestricted license as soon as possible. As part of the training contract, ATOs and operators may therefore promise to support their pilots in getting the “clean” CPL / IR license as soon as possible.

6. ‘Clean CPL License’ (5 above)

Special bridging arrangements to a CPL/IR are necessary (and foreseen by ICAO Annex 1) to assure that the student may complete his education and possess a valid and unrestricted license. Although functioning competency-based training courses should produce very low failure rates at this late stage, failures in the IOE phase cannot be excluded and coordinated “rescue-precautions” should be taken well in advance.
SECTION 5
GENERAL GUIDANCE – COMPETENCY BASED TRAINING AND GRADING

5.1 CHARACTERISTICS OF COMPETENCY-BASED TRAINING

What is competency-based training?
MPL courses require the competency-based approach to training. 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”. Competency-based training is not new to military air forces, but for much of the airline industry the application of a competency-based approach has been a most significant challenge for organizations planning MPL training. Most ATOs have never engaged in the development of a competency-based course before.

What is the traditional approach?
Legacy courses followed well established static lesson plans which ‘prescribed’ fixed amounts of training time. Once “time requirements” were fulfilled, it was assumed that the training objectives have been met and proven by successfully passed check rides.

Outcome-based approach
Except in only a few cases, MPL competency-based training does not ‘prescribe’ training hours, at least not as a predominant measuring tool; accumulated hour requirements are of secondary importance. Competency-based training focuses on the training outcome rather than training time. Training hours are replaced by defined performance criteria, which must be measurable. The design of a competency-based training course therefore requires special knowledge by the course developer.

Measurement of competencies
In practical terms, competency-based training requires the result of training (competencies to be achieved) to be continuously measured. Measurement is necessary to decide whether the desired level of a competency has been reached or more training is required.

System tracking
If this systematic approach is applied to each lesson it leads to a continuous tracking of quality.

Pre-defined norm
In each lesson the achieved level of competency is measured and compared to the desired level of competency (predefined norm). As a result a student is allowed to progress within certain tolerances from one lesson to another whenever he/she has reached the required level of competency. If this continuous process of assessing performance functions correctly, one day of further testing (such as “final checks”) could become obsolete.
Training input

The instructor-facilitated training “input” consists of measurable content, (Knowledge, Skills and Attitudes = “KSAs”), which will assure satisfactory performance in all required areas.

(Attachment 3 – Pilot KSAs – provides the complete list of the KSAs, their descriptions and abbreviations).

A competency-based system in operation can be more easily understood using the following model:

a) Training “output” is measurable:
   Output addresses the question of “what” is to be achieved. The output consists of competencies described in PANS-TRG, Chapter 3 Appendix B; these competencies are arranged in the sequence of flight phases. A competency unit (for example “Perform Landing”) includes a Task (for example “Land the aeroplane”) which is performed to a prescribed Standard (landing technique, speeds, rates, touchdown point, braking, procedures, etc.) under defined Conditions (VFR or IFR or Night or Day or XWind or 1 engine out, etc.). In addition to Threat and Error Management (TEM), eight “output”-competencies have been defined.

b) Training “input” is measurable:
   Input raises the question of “how” can a certain output be assured, which “KSAs” (Knowledge, Skills, and Attitudes) need to be focused on in order to enable a crew to perform in all phases of flight safe, efficient and effective. The instructional input consists of teaching the crew to apply the KSAs required to perform the tasks. KSAs are elements of the “Super”-competency TEM, which overarches all eight “output”-competencies (described as Competency Unit No. 1). These may be described precisely as word-pictures. There are various sets of KSAs / performance / or behavior markers in use in the global airline community. ITQI has collected and collated these into a harmonized set of 9 KSAs for use by training organizations and operators as a foundation set. KSAs may vary in terminology between operators, especially among those airlines who have used performance markers for some time. However, ITQI provides this ‘foundation-set’ of KSAs, into which local markers can be translated, to enable global analysis and improvement in training processes. This will allow the same principles to be applied in selection, training, and operations to assure that “input” and “output” is measured realistically throughout a piloting-career in a consistent way. (Attachment 4 – The Input-Out Model).

5.2 THE MPL GRADING SYSTEM

The Grading-System measures KSAs

These are compared with a NORM. The Grading System measures the performance levels to which the KSAs are being applied to execute the required task under the given condition. Thus it measures the level of competency achieved. The system may describe numerical values with precise word-pictures / expressions (descriptors).

Traditional descriptors

Many operators and FTOs today use quite primitive instructor-centered grading systems (i.e. “standard”, “above standard”) in operations. Instructor-centered grading directly displays the deviation of the observed performance (by the instructor) from the “norm”. It is an efficient way for instructors and an organization to measure performance of operational personnel, but provides limited value to the student as to how to improve.
Section 5 – General Guidance – CBT and Grading

Student-descriptors

However, in the training environment a measurement system which provides student-focused detail is more useful. Student-centered grading systems support the student by providing helpful descriptors about his/her level of performance (i.e. “I can describe-, apply-, practice-, consolidate-, master my task” ...).

Analysis

The grades collected are compared to a predefined norm which has to be developed by the Head of Training and his team. The result informs the Student/ATO/Operator whether the student’s performance and progression are “normal” or not. Note: Course evaluation: Comparison between the actual results of the class and the norm inform the ATO/Operator whether the program d ‘norm’ needs to be revised.

Example of a Grading System

The table below shows one solution for a grading system based on the Input-Output Model comparing grades with a NORM to support continuous assessment – critical to competency-based training.

<table>
<thead>
<tr>
<th>Competency Units 2-9</th>
<th>KSAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground Ops</td>
<td>SAW</td>
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<tr>
<td>Take-off</td>
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<td>Climb</td>
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<tr>
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<tr>
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<tr>
<td>Norm</td>
<td></td>
</tr>
<tr>
<td>Ground Ops</td>
<td>x</td>
</tr>
</tbody>
</table>

5.3 DATA MANAGEMENT FOR MPL COURSES

Competency-based training and course evaluation require professional data management. Data from the Grading System must be stored in an appropriate data base. Analysis of these data and comparison of the grades against the Norm form the basis for further development of the course, plus selection enhancement. This is a joint operator, ATO and the Pilot Aptitude Testing (PAT) team task. Operators lead this process and PAT providers / ATOs should adapt their systems with the quality system of the operator. NB. Regulators require access to such data to comply with the ICAO MPL Proof-of-Concept mechanism.
SECTION 6
GENERAL GUIDANCE – PILOT APTITUDE TESTING (PAT)

PAT is a part of the IATA Training Qualification initiative (ITQI); a ‘total system approach’.

Objective
Selecting the most appropriate people into the most advanced training program, to man the next generation of airliners fits into the IATA total systems approach to airline safety.

Early intervention
More effective Pilot Aptitude Testing will significantly reduce subsequent failure rates and associated downstream costs.

Recruiting challenges
Effective selection through pilot aptitude testing faces many new challenges today. Applicants from the new IT generation exhibit new thinking and expectations in the new world of rapid communications, which continue to evolve exponentially. Dependencies have developed for instant (rather than retained) information.

Interest and Motivation
Although not everyone enjoys basic pilot attributes, those who do need motivation for success. Different motivation levels, including less interest in a piloting career amongst new generations (partly due to reduced attractiveness of airline careers today) necessitate a serious and continuous review of pre-selection and Pilot Aptitude Testing processes. This is now well recognized by IATA and ICAO. Excellent tools now exist to pre-assess motivation, and this should be an early consideration in any PAT process.

Pre-education
It is a common error to focus on stringent testing procedures and to underestimate the importance of recruitment campaigns to assure sufficient numbers of applicants. Without sufficient applicants PAT is pointless. Airline stakeholders need to work towards more pre-education in schools and universities to attract fresh interest in piloting careers, particularly as the industry will need between 330,000 and 500,000 new pilots over the next two decades. A transfer of training costs away from students to airlines may also become a necessary strategy as demand bites and the applicant pool shrinks.

Pre-selection
Candidates’ Aptitude Testing should be performed before the start of MPL courses. In the case of MPL under EASA, training operators commit themselves to provide Initial Operator Experience Training to all contracted cadets. This means that the cadets will actually fly with passengers in public transport once they have been issued their restricted MPL license. It should be self-evident that only well selected personnel are admitted to this course.
Pre-training assumption

Competency-based training includes continuous assessment of performance during the course, on the assumption that selected personnel are able to follow the course within tolerable variances. This must not be confused with screening or selection. There is consensus industry-wide that grading or assessment during training must not be misused for screening and selection purposes; screening and selection must be performed before the course commences.

The operator in the selection process

In most cases, Aptitude Testing will be performed under the supervision of the operator, who will have developed a requirement profile for First Officers, with Aptitude Tests following this profile. Under EASA, IOE performance will serve as an important test criterion.

System sophistication

The larger the pool of candidates, the more efficient and successful the Aptitude Testing process will be. If an operator only needs few cadets and can choose from a large pre-tested pool, a simple re-testing procedure can be applied. Vice versa, if a high number of cadets must be selected from a small pool of applicants, the testing system must be very sophisticated.

Performance feedback

Performance data from IOE training must be fed back to the Aptitude Testing System in order to continuously validate and improve. Over time this assures that the operator will eventually receive exactly the quality of staff it desires. The pillars of a functioning PAT system are a multi-stage testing system (less expensive screening procedures first, costly selection procedures last); a well-designed “test battery” (set of tests) and a “selection team” to run the system.

Aptitude

Testing aptitude should include basic abilities (intelligence), operational competencies, social competencies, personality traits, and most importantly motivation. Motivation will always drive performance in both training and operations.

Testing Instruments

The least qualified instruments are freestyle interviews, while the highest qualified testing instruments are psychometric testing apparatus. Simulation-based testing of operational competencies can be performed best on specifically programed (PC-based) low fidelity simulators, since these will provide high values of predictive validity.

Testing providers

Operators unfamiliar with Aptitude Testing should contract a testing provider. The design phase of an aptitude testing system requires high management attention (definition of job requirements, application/re-application
criteria, presentation of results, evaluation procedures, hiring decision) and the involvement of an aviation psychologist is strongly recommended, to ensure scientific support. Human factors remain dominant in all accidents, and an aviation psychologist will prove invaluable in the PAT process. It is also advisable to have qualified and experienced Captains or First Officers included in the selection team.

Part of operator quality system

A PAT system however is part of the quality system of the operator and needs also to be evaluated at regular intervals. Evaluation of the PAT system addresses the question of its validity (whether or not the system measures/delivers what it is intended to measure). This process requires feedback from the operator (in case of MPL, IOE results, and later LOSA/ FODA data, line checks, sim-checks, training reports, and other reporting systems) and should be well-coordinated.

Direct entry to ab-initio entry

As the availability of direct entry pilots reduces, the industry will become more dependent on ab-initio entry to airlines, and some operators who have been selecting and hiring exclusively ready/direct entry pilots in the past may soon start taking in ab-initio pilots. This process will bring a number of challenges including a reduction of experience levels on flight decks.

It should be recognized that such change substantially affects the company culture and requires a significant adaptation by the operator. Ab-initio pilots form a younger group within the operator’s work force will most likely identify themselves to a higher extent with the company. Attitudes towards many issues will differ from those the company has been accustomed to when hiring ready/direct entry pilots. Mitigants to lower experience levels must include higher quality processes in selection and training.

Further PAT Guidance from IATA

Comprehensive information about Pilot Aptitude Testing is available as complimentary IATA Guidance Material and Best Practices for Pilot Aptitude Testing, commonly called “PAT Manual”. The PAT Manual is available on the IATA website (http://www.iata.org/ps/publications/Pages/pilot-testing.aspx). The purpose of the PAT Manual is to enable aviation managers to compare and discuss the characteristic strengths and weaknesses of available aptitude testing systems with aviation psychologists and test providers, and to collaboratively develop a suitable solution for their company. The aim is to provide a hands-on document useable by all, which eliminates the inevitable confusion from varying terminology and ideas in the industry.

The IATA PAT Manual provides an overview over all areas of aptitude diagnostics and includes both the screening and the selection process.

Obvious benefits

Benefits of an effective aptitude testing include enhanced safety, lower overall training costs, higher training success rates and a more positive working environment. Effective aptitude testing saves a lot of money. The costs associated with implementing a functional aptitude testing system are significantly lower than the costs of subsequent high failure rates during training which relies on immature testing. (Attachment 8 – IATA Guidance Material and Best Practices for Pilot Aptitude Testing – provides the Executive Summary of the PAT Manual).
SECTION 7
GENERAL GUIDANCE – THREAT AND ERROR MANAGEMENT –
THE “SUPER-COMPETENCY”

Threat and Error Management (TEM)
A model derived from a decade of analysis at the NASA / FAA Crew Research unit of the University of Texas
the threat and error management (TEM) model has been built from a large data-base, providing an important
tool to help pilots identify and manage threats (hazards) and errors during flight.

Embedded TEM in MPL
To highlight its special importance, PAN-TRG dedicates Competency Unit No. 1 of 9 to TEM. It overarches all
crew activities. Some training organizations have tried to accommodate TEM requirements via short one-off
‘add-on’ modules [TEM course complete = box ticked!] But TEM is required in everyday operations throughout
an airline career spanning 30 years or more, and should be embedded continuously in the training process.
[Under ICAO ANNEX 1 Edition 10, Threat and Error Management (TEM) is not only embedded in the multi-crew
pilot licenses but in all other licenses as well].

Still relatively new
Although already introduced in the ICAO Human Factors Training Manual (1998), TEM is still new for many
organizations and more time is needed to explain and understand the relationship between CRM and TEM.
PANS-TRG Chapter 3 Attachment C can be used to understand in detail how TEM functions. CRM is not
replaced by TEM; CRM is a management component.

Important considerations regarding TEM:
   a) TEM is a state-of-the-art safety concept of paramount importance, and must be embedded continuously
       throughout the MPL program
   b) TEM plays a most important role in the process of transferring a novice (ab-initio student) into an expert
       (Airline First Officer)
   c) TEM can be understood by students at a very early stage and practiced throughout the course with
       increasing success
   d) Implementing TEM into everyday training creates innumerable opportunities for students to search out,
       recognize, and manage safety issues in a professional / structured way and progress from simple
       decision making to strategic flight management

The link between TEM and KSAs
Simply put, TEM stands for recognition and management of threats, errors and undesired aircraft states through
the application of countermeasures. Countermeasures are the tools needed to produce safety. Training crews in
a modern way therefore demands to educate them in applying countermeasures in order to achieve and
maintain high margins of safety.
Most countermeasures coincide with KSAs
(Knowledge, Skills and Attitudes), see Attachment 3 – Pilot KSAs). TEM is an overarching KSA, and KSAs are the TEM generator. Focusing training on the KSAs is an effective way to apply TEM and enhance safety in operations. The table below compares the Pilot KSAs, which were developed by the ITQI working teams as a result of the harmonized best practices in this field, to TEM countermeasures as described in PANS-TRG.

<table>
<thead>
<tr>
<th>Threat and Error Management</th>
<th>Draft KSAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICAO PANS-TRG</td>
<td>IATA ITQI EBT</td>
</tr>
<tr>
<td>July 2006 – Attachment C</td>
<td>December 2010</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Planning Countermeasures</th>
<th>SOP Briefing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Plans Stated</td>
</tr>
<tr>
<td></td>
<td>Workload Assignment</td>
</tr>
<tr>
<td></td>
<td>Contingency Management</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Execution Countermeasures</th>
<th>Monitor / Cross-Check</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Workload Management</td>
</tr>
<tr>
<td></td>
<td>Automation Management</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Review Countermeasures</th>
<th>Evaluation / Modification of Plans</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inquiry</td>
</tr>
<tr>
<td></td>
<td>Assertiveness</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Not comparable line-by-line</th>
<th></th>
</tr>
</thead>
</table>

**TEM Summary**

Within ab-initio courses such as MPL, TEM should be embedded as a living behavior. Every lesson should address TEM.

**Example**

In addition to featuring TEM content as a specific learning objective one common strategy is to include a short Question and Answer discussion about expected threats and errors in every lesson plan during briefing. “So in this aspect of the exercise, what do you see as the threats and what countermeasure could you suggest to manage these?” After completion of the lesson the instructor will review and compare threats and errors experienced with those actually encountered, and discuss the effectiveness of applied countermeasures with the students. The MPL instructor should focus his or her instruction and feedback on KSA application sequence and the way in which the KSAs were applied.
SECTION 8
GENERAL GUIDANCE – MPL COURSE DESIGN

8.1 MANAGEMENT
Successful MPL course delivery builds on the determination of management to invest manpower in operator-driven course design, course content, and properly qualified instructors to train airline students.

Highest Guidance
When constructing the lesson plan for an MPL course most FTOs use guidance from ICAO PANS-TRAINING. It is important to be aware that PANS material is generally not binding. PANS-TRG serves as supportive guidance material in Instructional System Design and Course Development. PANS-TRG Chapter 2 and the Attachment Chapter 2 describe one possible way of structuring an MPL course. [EASA has progressed ICAO regulations further and may be referred to in this Section].

Variable previous experience
Depending on the maturity of the organization, experience with ab-initio and competency-based training, and the availability of training devices (FSTDs) will be variable.

Initial planning for MPL courses
The initial design of an MPL course requires a great amount of management attention and documentation. The following steps will be needed:

1. Involve the Licensing Authority from the outset; as subsequent steps may require their inputs
2. Set up the cooperation framework between operator and ATO
3. Establish administrative processes
4. Design or utilize a suitable document management system

Regulatory understanding and support
Competency-based MPL training prescribes continuous improvement, based on feedback from the operator. It also allows a flexible allocation of training hardware and courseware. Therefore course quality management must be seen in a new light, depending not only on content and delivery, but also on new emphasis on performance measurement. [Eventually performance measurement should extend to long-term flight operations and FOQA data, to be fed back into MPL improvement].

No simple re-arrangement of courses (CPL to MPL)
In order to design an MPL course it is not sufficient to rearrange existing modules of traditional courses into an MPL course structure, yet there have been examples of this approach already in play. Such a design may work in a loose sense at the start, but is not MPL philosophy as intended under the ICAO 9868 doc. To follow this
process traditional modular / inventory-based / box ticking training methodology would be replicated, contradicting the underlying philosophy of competency-based training. Such a design process would fail to capitalize on the advantages of competency-based training.

**Priority in course design**

When developing MPL courses, the competency-based training element should be addressed first. It is still a common fallacy to focus on the traditional flying hours on aeroplanes and simulators, and rush into course content before establishing the Competency-Based Training framework.

### 8.2 THE MPL ENVELOPE: TRAINING HOURS AND LANDINGS

**Minimum parameters – MPL**

ICAO Annex 1 intentionally provides room for innovation and creativity. In the competency-based MPL course in ICAO Annex 1 there are only 3 fundamental parameters which must be met:

1. Training in actual training aeroplane must not be less than for a PPL (+ night flying, + introduction to basic instrument flying, + upset recovery). [NB MPL does not require the issue of a PPL, which complicates the syllabus]

2. Total training time (the sum of aircraft and FSTD) must be at least 240 hours

3. At least 12 take-offs and landings are performed in LT (with the possibility to reduce to 6 under National Regulatory approval) on the aeroplane (MPA) for which the type rating is sought (without passengers on board), before the MPL graduate is allowed to start the IOE phase

**Hours and Competency**

With the exception of the design parameters described above, be reminded that the exclusive use of a certain number of exercises or hours is in conflict with competency-based training. The terminal measurement criteria for competency-based training is the sustained attainment of predefined competencies against a predefined norm. The time it takes to reach this goal is of secondary importance.

**Flexibility**

The flexibility allowed in MPL, through the limiting of prescribed parameters, constitutes one of the greatest advantages of MPL when compared with traditional courses. This broad platform allows for an on-going innovation process in the development and improvement of pilot training.

**Transition to competency-based training**

It is recognized that the transition from a traditional inventory / hours based ab-initio training process, to competency-based training, can only be successful in managed steps.
Differences in MPL courses to date

From the forgoing, it should be better understood why existing MPL courses differ from each other. Not only solutions for the Core phase (1) vary, but Basic and Intermediate Phases (2 and 3) show significant differences between providers. Some ATOs use propeller driven single-engine (SE) and/or twin-engine (TE) piston engine aeroplanes in Phase 2, others use light jets, and some use 50-ton jet transport MPA FSTD of the type which the students will eventually operate, at an early stage of training.

Understanding Competency-Based Training

It is especially important that MPL course developers understand the concept of competency-based training before commencing course construction.

ICAO Design Model

The ICAO ‘Trainer’ Competency-Based course design Model contained in PANS-TRG lists these design steps:

- By means of a task analysis the duties of a multi-crew in modern transport airplane operation were defined
- The resulting list of tasks was arranged along the 8 phases of a flight profile (from Ground/Pre-flight Operations to Post flight Operations), preceded by TEM. This task was accomplished during the ICAO FCLTP
- The resulting 9 competency units were further broken down to competency elements
- The elements have been further split up into performance criteria (as observable behavior), each criteria provided with a condition statement and a standard statement
- This leads to the curriculum by defining terminal training objectives, mastery tests, training modules and finally devices for the different stages of training

8.3 MPL PHASES

[Phases 1 / 2 / 3 / 4 are also referred to as Core / Basic / Intermediate / Advanced]. It should be understood that even the breakdown into 4 phases is a preliminary conceptual model for MPL to facilitate the transition from the hours-based to competency based training. A mature competency-based training scheme does not need any division into phases. It only requires a clear definition of the terminal training objectives and a robust Student Management System to assure that the novice-to-expert transfer follows the predetermined norm in all relevant competencies, based on a seamless continuous assessment of every training lesson. The basic ICAO framework outline of phases, content and devices is illustrated in PANS-TRG, Chapter 3 Appendix A (Attachment 9 – MPL Training Scheme).

A gradual process

In the absence of reliable scientific data at this time, the chosen path under MPL is to allow for gradual innovation based on accumulating empirical feedback.

Review Boards

For the first years of MPL operations international review boards have been established to compare the outcome and facilitate the distribution of experience and lessons learned.

*In course design, also refer to Section 4 of this manual – Considerations with the National Authority.*
SECTION 9
GENERAL GUIDANCE – TRAINING LOCATIONS

Regulatory provisions
Neither ICAO SARPS and PANS-TRG nor JAA/EASA PART FCL regulations, nor other regional MPL regulations have established rules concerning a minimum or a maximum number of training locations to be used during the conduct of an MPL training course.

The Ideal solution
In line with the holistic seamless concept of MPL as a single program, the ideal solution would be to locate all theoretical and practical training at one integrated location. But this could not be realized by most of ATOs so far; most of which were not ‘green field’ designs, where available facilities had to be combined. Some ATOs are in the position to deliver theory and simulator training at one place and much need to use a base aerodrome abroad for Phase 1 (Core Flying Skills).

Advantage of single location
For course designers with the option to develop MPL at a single integrated location, there is one prominent advantage. The integration of the instructor corps between the most airline-experienced (SFI/FSIs) to least airline-experienced (FIs) brings immense potential benefits. Integration at the same workplace enables frequent instructor interaction, with cross-pollination of ideas and instructional focus, and workplace efficiencies from flexible theory instruction. In this situation, co-located instruction becomes convergently focused on the primary objective (training for airlines). A parallel benefit is to create a single-team mentality, rather than the traditional compartmentalized silo-type cells of expertise often seen in the training industry.

Close proximity locations
A second best option is closely-located flight and simulation facilities which will also enable instructor integration to some degree.

Remote-multi-locations
Remote locations, especially across National boundaries, make such integration and information sharing very much more difficult to achieve.

Non-native-English speaking students
For MPL providers to non-native-English speaking students there is a clear advantage to train in an English speaking environment to ‘force English speech’, embed a more international culture, and rapidly improve English language proficiency. This is generally achieved at an ATO abroad in an English speaking country, but the option also exists to set up an ATO in the students’ country of origin, with English as the mandated medium of instruction and study, and the student hostel within the facility.
Environmental factors
Weather and economical aspects must be considered, but an advantage of the MPL training is the sharply reduced requirement for training in light aircraft (compared to CPL), exposing the ATO to less training disruption risk from weather or ATC. The blue-sky clear weather environment may actually work against the objective of MPL training which aims at airline-relevant IFR departures and arrivals and flight in IFR conditions.

Pre-ATO education
For English language development in non-English countries, colleges and universities which feed into an ATO can be encouraged to accelerate ICAO English language acquisition while still studying in these establishments. The latter objective can be enhanced in a classroom setting using PC-based ATC speech recognition systems. A student pre-selection can be conducted for the operator and ATO one year before graduation.

Remote training aerodromes
The use of remote GA aerodromes for the majority of the flight training may not be the optimum solution for MPL training. While these airfields may provide an undisturbed training environment for VFR flights and circuit training, the lack of realism and operational complexity associated with commercial operations will not be available at GA off-site training fields, and exposure to relevant interaction with ATC and commercial traffic reduced.
SECTION 10
GENERAL GUIDANCE – THEORETICAL TRAINING

Task to complete
During the development of MPL the ICAO Flight Crew Licensing and Training Panel did not review theoretical knowledge requirements, but did identify the need to do so. This is on the list for further action. So, from ICAO MPL requirements, for the time being theory remains identical to the inventory-based aeronautical knowledge required for the classic ATPL, validated via the conventional ATPL theory examination.

Integration of theory and practical
PANS-TRG Chapter 3.3.2 states: Each phase of the MPL Training scheme shall be composed of instruction in underpinning knowledge and in practical training segments. Training in the underpinning knowledge requirements for the MPL shall therefore be fully integrated with the training of the skill requirements.

PANS-TRG Chapter 3 Appendix C 3.1 a) states: The implementation of the MPL requires the development of an approved training program that blends the various types of training (knowledge and practical) with the media (classroom, various level of simulation and aeroplane).

Theoretical training should ideally be integrated into the course program and delivered ‘just in time’. [Most ATOs at this time have not yet succeeded in achieving a coordinated integration of theory modules into the course structure].

Training at separated locations (also see Section 13)
Aeroplane flight training and simulator phases often take place at different locations remote from the home base of the ATO and students. Therefore the ATPL theory is sometimes delivered in only a few modules /phases, and even in a single block, prior to the commencement of practical training in phase 1.

ATPL Examination
The official ATPL theoretical test is generally administered before commencing the practical training in Phase 2.

Alignment of theory with practical
To follow the principle of competency-based training, and to move some way towards MPL philosophy (despite the above inventory-base acquisition of this knowledge), event or scenario-based training is often delivered. For example, as part of lesson preparation, students work through the lesson description which contains a section referring to the underpinning aeronautical knowledge necessary to successfully conduct the particular training tasks in that lesson. Thus theory topics are matched with practical lesson content. Such ‘just in time’ event-based knowledge acquisition is far more attractive to students compared to the traditional inventory based teaching of the required subjects of aeronautical knowledge lined-up along a theory curriculum without any direct affiliation to practical application.
SECTION 11
GENERAL GUIDANCE – INSTRUCTOR QUALIFICATIONS

The MPL Instructor’s role
The most advanced training equipment and program will not address training objectives effectively without appropriate instruction, yet sub-optimal equipment used by an effective instructor, may still deliver. MPL sets the instructor standards bar to a higher level.

A new standard of Instructor for MPL
MPL sets out to augment the new training equipment (FSTD) standards, with a new standard of instructor. The ultimate competence of an MPL graduate is related to the quality and relevance of instruction.

Legacy ab-initio content and instruction
ATOs were permitted to abandon full stall training many decades ago, and the absence of this training may have led to the increase in LOC incidents seen in recent years.

For many existing ab-initio ATOs, low-time flight instructors (FIs) are employed inexpensively while many are building their hours for airline operations. As a result, turnover is high, and instructor continuity for students is low. Many traditional FIs may be distracted by this agenda; less experienced or motivated to teach multi-crew concepts, TEM, or airline operations with appropriate knowledge or conviction. This is not the best learning environment for ab-initio student pilots [First learnt = first reverted to].

The optimal MPL instructor
The MPL FI must be better trained to understand both airline and ab-initio training objectives, and should only enter the system via:

- Careful selection to secure higher levels of motivation, enthusiasm and empathy for MPL
- More attractive career paths and remuneration to enhance retention and continuity (this may even include an operator seniority number)
- Effective MPL instructor training / retraining, including competency-based instructional skills

Regulatory requirements for MPL instructors
In consideration of the above, National Regulators have produced various schemes of qualification requirements for MPL instructors. These qualification requirements depend on the phase in which the instructor intends to teach, and recognize the exceptional importance of instruction in MPL.

All instructors engaged in MPL training (including those performing flight instruction in early phases, simulation, skill tests, landing training and IOE) need special preparatory training to qualify for this task.
**One MPL instructor requirement set**

Guidance Material of the DRAFT Opinion to EASA FCL shows one possible arrangement.

**GM (Guidance Material) to FCL.925**

**MPL Instructors**

The following table summarizes the instructor qualifications for each phase of MPL integrated training course:

<table>
<thead>
<tr>
<th>Phase of training</th>
<th>Qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line Flying Under Supervision in accordance with Part OPS</td>
<td>Line Training Captain or TRI(A)</td>
</tr>
<tr>
<td>Phase 4 – Advanced Base Training</td>
<td>TRI(A)</td>
</tr>
<tr>
<td>Phase 4 – Advanced Skill Test</td>
<td>TRE(A)</td>
</tr>
<tr>
<td>Phase 4 – Advanced</td>
<td>FSI (A) (NB new term under EASA?) or TRI(A)</td>
</tr>
<tr>
<td>Phase 3 – Intermediate</td>
<td>FSI (A) or TRI(A)</td>
</tr>
<tr>
<td>Phase 2 – Basic</td>
<td>- FI(A)/IRI(A) + IR(A)/ME/MCC + 1500hrs multi-crew environment + IR(A)</td>
</tr>
<tr>
<td></td>
<td>instructional privileges, or</td>
</tr>
<tr>
<td></td>
<td>FI(A) + MCCI(A), or FI(A) + SFI(A), or</td>
</tr>
<tr>
<td></td>
<td>FI(A) + TRI(A)</td>
</tr>
<tr>
<td>Phase 1 – Core Flying Skills</td>
<td>- FI(A) + 500hrs, including 200hrs instruction</td>
</tr>
<tr>
<td></td>
<td>Instructor qualifications and privileges should be in accordance with the</td>
</tr>
<tr>
<td></td>
<td>training items within the phase. STI for appropriate exercises conducted in</td>
</tr>
<tr>
<td></td>
<td>a FNPT or BITD.</td>
</tr>
</tbody>
</table>

(Attachment 5 – MPL-Instructor Training Course – provides the JAA/EASA requirements as a sample).

**MPL FI airline jump seat rides**

Exposure to customer airline jump seat rides is a useful activity during MPL FI training to instill an understanding of airline operations.
SECTION 12
GENERAL GUIDANCE – UPSET PREVENTION & RECOVERY TRAINING (UPRT)

Industry deficiency

UPRT is a requirement of the new multi-crew pilot license because for many decades, ATOs have been permitted to exclude full stall training in their ab-initio syllabus, and today loss of control (LOC) plays an increasing role in airline incident and accident statistics. The importance of teaching Upset Prevention and Recovery techniques effectively is now paramount to airline safety gains from training. UPRT is an overarching term, covering stall recovery techniques but reaching far beyond that.

UPRT in which Phase?

UPRT does not necessarily have to be delivered in Phase 1 (Core Phase) although PANS-TRG requires this. It can be taught at any time during the MPL course. There are good reasons to deliver UPRT at a later stage of the course, for example after Phases 2 or 3. This would be advantageous because UPRT must be delivered both (a) in an aeroplane, and (b) in an FSTD (e.g. 2 modules, (a) a “feel” module / repetition / application of techniques, and exposure / adaption to sensorial experience) to be taught in the aeroplane), and (b) a “look”-module (techniques, to be taught in the airliner simulator).

UPRT instruction

UPRT-qualified instructors are essential for this task. Special attention should be given to instructors (FIs and SFI/FSIs) teaching UPRT, because (a) the FIs must have experience in aerobatic flight with strong pedagogical skills, and (b) both FIs and SFI/FSIs need to be instructing ‘from the same UPRT page’. The FI should therefore observe UPRT training in the MPA FSTD with an FI / SFI-FSI to align instruction with the longer-term goal. This will ensure that students fully benefit from valid UPRT, and avoid potential negative outcomes from inappropriate instruction.

UPRT Lesson Plan content

ATOs should derive the lesson contents from existing UPRT aids which are available from aeroplane manufacturers, regulators and specialized training organizations.

UPRT is not Aerobatic training

UPRT should not be misinterpreted and misused as aerobatics training. Although basic aerobatics do contribute to certain piloting skills, aerobatic maneuvers are neither required for an airline pilot nor do they contain the same handling techniques as UPRT.
Student confidence-builder

As a student confidence-builder, UPRT can be the most valuable tool to build confidence of the student in his/her ability to control the aeroplane because it provides realistic proof that he/she is able to recover normal flight from any “3D” situation.

UPRT development

A number of industry groups are working to develop effective training transfer in UPRT instruction from flight to FSTD, including ICATEE (the RAeS International Committee for Aviation Training in Extended Envelopes) http://www.idt-engineering.com/ICATEE.html.

ICATEE

The International Committee for Aviation Training in Extended Envelopes (ICAO / RAeS IWG) is developing UPRT recommendations, and some interim information is as follows:

There are four critical points of understanding for effective UPRT:

1. **It's a holistic process**: There is no single simple solution to UPRT
2. **Training Aircraft**: Essential to provide the ‘startle factor’, physiology reality and G, and deep learning, but cannot reflect an airliner feel or environment
3. **FSTD**: Some limited G-cuing can be produced by vibration and seat tipping, but the limits of simulation and tested data must be respected
4. **Instructor**: It is essential that specialist UPRT instructors are trained to deliver the airliner message, and avoid negative training (a reminder of inappropriate training applied to the use of rudder in one major airline was the A300 fin failure in USA)
SECTION 13
GENERAL GUIDANCE – AEROPLANES IN MPL

Current status
Practical flight training is divided into aeroplane and simulator training. ICAO Annex 1 prescribes that not less than the requirements for PPL training must be fulfilled in the core phase of an MPL plus instrument and upset prevention and recovery training (which is just 35 hrs including 10 hrs solo). However no ATO will receive an approval for such a low number of aeroplane hours at this time. A reduction of flying hours below the present level of CPL/IR or ATPL Integrated Courses hours may be performed, linked to the results of a feedback loop reporting the results of the IOE training. To improve training, a gradual “trade-off” of aeroplane hours towards FSTD time is already underway, even in legacy CPL programs.

Discussion – aeroplane training
The provision above has been vigorously discussed amongst training experts for years. To date no-one has been able to convincingly explain / validate / or justify why light aeroplane training is essential for airline pilots, or precisely what indispensable benefits there are from such training. However there is general consensus that there are some learning objectives which most probably can be trained only in an aeroplane. Inputs to the debate include comments such as ‘airline students must experience the real physiological experience of flight’, and must have gained deep understanding from at least some ‘flight fright’ situations. There is consensus that even by increasing training time in small training aeroplanes significantly better training results cannot be seen in areas crucial to improve flight safety in airline operations. A small sample analysis supports this (see table in Section 2); no correlation could be found between more hours of training in a light aircraft and improved performance during IOE. Conversely, experience has shown that more training in simulators which replicate transport category aeroplanes and their flight model effectively improves manual airline flying skills.

Flight replication in simulation (FSTD fidelity)
Although simulators presently cannot provide 100% realism (especially during the landing phase and in extreme attitudes), the fidelity of these training devices is steadily improving.
SECTION 14
GENERAL GUIDANCE – FSTDS IN MPL

FSTDs in MPL not yet set in stone

Even the 4-phases model in MPL should not yet be set in stone. It is not clear yet if the Core Flying Skills Phase 1 really needs to be located at the beginning of the course, or if it would be of value to start with synthetic flight training in FSTDs and position core flying skills training between later simulator phases.

Future FSTD design trends in support of MPL and training industry:
(WATS 2011)

1. ATC system correlated to visual traffic – available now on new FSTD deliveries with some limitations in speech recognition of variable student accents – development continues towards FULL automation
2. Improved modeling of approach / land phases, stalls, and extreme attitudes
3. Improved compliance with upset recovery requirements from ICATEE
4. Improved, more user-friendly instructor operating stations (IOS)
5. Off-board IOS allows better peer-to-peer learning in the cockpit and has been successfully used in military and ATC settings) [Doc 9625 already requires off-board IOS for helicopter FSTDs]
6. Monitoring of pilot performance from FSTD data (similar to QAR / FOQA) using similar tools to track training performance
7. Improved play-back systems for sessions de-brief
8. Improved lateral cueing close to touch down and in roll-out and taxi
9. Improved simulation of aircraft bending and individual tires touch-downs on landing
10. EBT – animation of actual incidents and accidents to allowing crews to try out scenarios and compare performance
SECTION 15
GENERAL GUIDANCE – ATC SIMULATION IN MPL

Communication errors between flight crews and ATC remain a serious safety threat in the airline industry.

ATC Systems in MPL

Although not yet fully evaluated, design planning assumes the eventual availability and use of ATC systems for almost all levels of FSTDs, and there is no reason why these should not be applied in early phases. Where students use English as a second language, early application of ATC system speech recognition software will accelerate the attainment of ICAO Aviation English to Level 4 or above.

Regulations on ATC Simulation

JAR FCL Amendment # 7 / EASA Part FCL require the provision of ATC simulation in the training Phases 3 and 4 of MPL.

ICAO PANS-TRG recommends the provision of the Air Traffic Control environment in Attachment A to Chapter 3 [Competency-Based Training and Licensing for the Multi-Crew Pilot License – Guidance on the Design and Development of a Multi-Crew Pilot License Training Program]. EXTRACTS:

§ 2.2 reads: ...starting with the Basic phase of training, use of FSTDs, ranging from part-task training devices, through generic systems to full motion, full visual, high-fidelity, type specific flight simulators that also permit the introduction of interactive air traffic control environments, will begin to dominate the training....and

§ 3.10.2 reads: The Type III FSTD (meaning the device used in phase 3) must permit the progressive introduction of a sophisticated flight environment including ATC, flight guidance systems, EFIS, FMS and TCAS.

ICAO Doc 9625 has been extended to include the qualification and test requirements for all FSTDs used for airplane training with a corresponding document title change to Manual of Criteria for the Qualification of Flight Simulation Training Devices (Doc 9625 Edition 3), was published by ICAO in 2009.

PART II of Doc 9625 Ed. 3 describes in Appendix A the qualification requirements for the simulator feature Environment-ATC for the 3 fidelity levels Specific (S), Representative (R) and Generic (G) in all details and contains the following comment:

Recognizing that the implementation of a dynamic ATC environment has not yet been evaluated and verified through training, the progress towards this level is expected to take place over a period of time. Primary efforts by industry should be aimed at the MPL (phase) 3, MPL (phase) 4 and first TR needs. Therefore the requirements listed for ATC environment in this section are intended as goals that should be achievable but are recognized as not fully capable at this time.

Doc 9625 Ed.3 Part II Attachment O, Guidance for Environment – ATC, states:

It is recognized that the flight simulation and training industry is currently developing technology applications and training requirements to include ATC environment simulation into FSTDs. However, the use of ATC environment simulation in FSTDs is still in the final development stage of its lifecycle. Suitable guidance
material will be written and published, in an update to this document when sufficient experience has been gathered and the requirements reviewed by the industry.

Appendices A, B and C in Part II and in Part III of this document contain temporary material for ATC environment simulation requirements and testing that should not be treated as prescriptive for FSTD qualification at this time. The content of these three appendices should be used as guidance to industry for the continued development of ATC environment simulation for FSTD.

What is clear to an experienced SFI/FSI is that any automated ATC environment system is hugely preferable to ‘instructor mimicking’ of ATC; very difficult to do convincingly, and impossible to synchronize with air traffic seen on the visual system. Such mimicking also distracts the instructor from his or her primary task, and sometimes the students from their concentration!

**Interim regulatory approaches to ATC requirement**

While the new ATC systems are being thoroughly evaluated, the Aviation Authorities of the States conducting MPL courses are handling this issue with sound judgment by allowing for alternative means of compliance (AMC). Current AMCs range from:

a) the instructors provide structured ATC services (the legacy approach)

b) MPL students flying as additional crew members for a certain amount of sectors in the client airline’s route network

c) exchanging classroom training with air traffic controller students or visiting tower (and/or approach/area) controllers at their respective job sites to get a better understanding of the interactions

However, such initiatives are likely only to be ‘ad hoc’ and difficult to sustain throughout the training process, which is an ideal requirement in MPL.

**EASA Status**

To cater for this situation the European MPL Advisory Board has decided in November 2010 to wait another 12 month before taking a decision on the further course of action on this issue.

**Update – ATC Systems in FSTDs**

*From research conducted at the World Aviation Training Symposium (WATS) in April 2011:*

- **Technical capability:**
  The technical capability exists to produce automatic ATC systems, but investment and determination are not yet at a level to complete the process in a short time scale, despite ICAO docs 9868 and 9625.

- **Availability:**
  ATC systems are now available in some of the latest FSTDs (lev D / Type VII) which synchronize ATC (traffic chatter) with visual traffic seen by the crew.

- **Speech recognition:**
  However full speech recognition (SR) functionality (student pilot to ATC) may not yet be activated as differing student accents are still not ‘recognized’ by the SR, which is programed for exact ICAO English. Suppliers of this software have indicated that they can develop individual accented SR if
provided with the relevant voice files to adapt the software for each accent. A technology mitigation available today is for the instructor to manage the controller responses from the IOS, in a “manual mode” for interactive and dynamic ATC environment. The challenge is somewhat ‘chicken and egg’; until the MPL is well established, with corresponding customer demand, the investment in ‘accented’ SR may be sluggish, despite the publication of ICAO doc 9625 in 2009. [There are similarities with the process by which customized visual airport models were built up into the libraries of today].

A safety-driven initiative

The decision to require ATC systems in MPL was safety-driven and should be applied to airline pilot training as soon as possible. As a requirement, it is expected that the functionality of these systems will soon be delivered, encouraged by MPL customer and regulatory pressures.
SECTION 16
SPECIFIC GUIDANCE – MPL BY PHASES

16.1 CONSIDERATIONS IN PHASE 1 (CORE)
[Also see Section 12 – Practical Training Aeroplanes].

Instructors in Phase 1
Flight Instructors (FI) – also see preceding general considerations, and instruction for UPRT.

SOPS: SOPs can be harmonized into lookalike operator-specific A320, B737, CRJ, etc. SOPs. Basic Pitch and Power flying philosophy must be applied correctly so that there is no negative training in this phase and re-learning in later phases can be avoided. Stabilized final approaches should be flown instead of PPL-typical idle-approaches, etc. Cockpit preparation and Checklist philosophies should be harmonized with the procedures of the cooperating operator as far as possible.

TEM and theory-practice in phase 1: TEM must become the student and instructor ‘daily bread’. Previously acquired ATPL theoretical knowledge must be applied, especially Basic Performance and Meteorology. The relevant documentation must always be accessible in briefing rooms and by electronic means. In many ATOs these changes require a considerable amount of instructor training. Most instructors will enjoy the challenges of the Core Phase because it requires them to deliver routine training in a new professional “style”.

UPRT and student confidence: It is important to brief the instructors on the important value of the Core Phase, which is to build confidence in core flying skills. The focus should be on confidence building and not so much on the formalities of modular PPL courses. UPRT Instructors must be trained and qualified VFR Flight – Phase 1: As MPL cadets must reach the competency level required for a holder of a PPL VFR flight must therefore be trained at least to this extent.

IFR Flight – Phase 1: ICAO requires an introduction to instrument flight in an aeroplane. This must not be confused with an instrument rating. During the later phase of the MPL course the students will receive sufficient instrument training in simulators; therefore extensive approach training is not required in the Core Phase. Also instructors can be relieved from the pressure to deliver a full instrument rating in the Core Phase. The aim of the introduction to instrument flight is to provide the student with the realistic sensory impressions of actual flight under instrument conditions.

Training aircraft in Phase 1
For MPL course designers, especially those planning a new MPL ATO operation, it is important to keep the primary objective of MPL (airline pilot training) firmly in mind from the start of training. Training aircraft with some similarities to airliner cockpits. Some desirable features are EFIS, FADEC, radio and IFR capability, and 4-seater cabins – with two students observing the training, as well as air-conditioning for very hot climates are advised.

For UPRT the ATO will have access to a few aeroplanes approved for aerobatics flight.
Phase 1 is NOT PPL Training: Although this phase will mostly be flown in small single-engine aeroplane and covers the content of a PPL, it is important that it is not confused with pure PPL training. MPL courses should be clearly differentiated from modular PPL training by applying professional techniques and structures from the outset.

**FSTDs in Phase 1**

Adding training value to reduced (aircraft) flight time

A number of MPL courses augment reduced (actual) flight hours of instruction by applying Type I FSTDs with powerful visuals mated to the training aircraft used. The full flight exercise can be pre-flown in the mated FSTDs, then flown in the air (video recorded), and then debriefed using video replay.

16.2 **CONSIDERATIONS IN PHASE 2 (BASIC)**

**Instructors in Phase 2**

FI & SFI/FSI.

Relative instructional value – each phase

There has been a tendency so far to focus on phase 1 (core) and phase 4 (advanced/type rating), undervaluing Phases 2 and 3. It is important to highlight the function of these phases, which is to introduce the whole scope of multi-crew operation and instrument flight in an environment similar to future airline operations, as early as possible. While multi-crew KSAs and TEM should be introduced at the start of an MPL program, Phase 2 is especially critical to the deeper development of the necessary competencies for airline operations.

Normally during Phase 1, Flight Instructors (FIs) are used, and during Phases 3 and 4, TRIs or FSIs. For Phase 2 the ATO should select multi-crew experienced instructors and brief them thoroughly on the content of this phase. Phase 2 has the potential to be the most innovative part of an MPL course, and in the conduct and effectiveness of competency based training.

Phase 2 requires instructors who are able to combine basic and advanced instrument flight instruction with target-aimed operational instruction in typical airline operator flight crew environment. This could be FIs with robust multi-crew experience or TRIs/FSIs with experience in basic and advanced instrument flight instruction. The main issue in Phase 2 is to select and train instructors capable of teaching the whole set of “KSA”s from program-start and apply continuous assessment in the most learning-conductive way. An ideal instructor for Phase 2 could be an experienced first officer from the contracting operator who is additionally rated for instrument instruction. **NOTE: For longer term it may be worth considering the creation of a special "MPL Phase 2 instructor rating".**

**Training aircraft in Phase 2**

Due to the fact that small, propeller driven, straight wing, single pilot, airplane are not realistic multi-crew training devices (in conformity with the philosophy of the MPL), it is suggested that the design of an MPL course should provide for completion of single pilot airplane training in Phase 1. **For reasons related to logistics and resource management, this may not be possible for an ATO, and some programs may need to ‘spread’ the aircraft flight
hours across Phases 1 and 2, which is allowed for in MPL] However, if the aircraft flight phase can be completed in Phase 1, this will pave the way to start realistic multi-crew operational training from the beginning of Phase 2.

[NB. Regarding the value of training future MPA pilots on small, propeller driven, straight wing, single pilot airplanes refer to ATTACHMENT 6 – Working Paper from the ICAO Flight Crew Licensing and Training Panel (FCLTP) which in part led to the decision to substantially reduce actual flight in small single pilot airplanes and replace it with structured training in real multi-crew environments.]

**FSTDs in Phase 2**

The EASA MPL Training Scheme suggests the use of a single or multi-engine airplanes in Phase 2 as well as FSTDs. As discussed, this does not fit ideally with the objective of early introduction of multi-crew operations, and may be a contradiction with other training scheme guidance suggesting that from Phase 2 onwards PF and PM (PNF) hours can be logged.

Although training in Phase 2 can be generic it is advisable to use a FSTD based on the flight model of a modern twin engine multi-crew transport category aeroplane.

(Attachment 6 – The value of using small aeroplanes for future Multi-Crew Airline Pilots).

**16.3 CONSIDERATIONS IN PHASE 3 (INTERMEDIATE)**

**Instructors in Phase 3**

TRIs or SFI/FSIs.

**FSTDs in Phase 3**

MPL is a performance-outcome approach to training. The MPL competency framework should accommodate varying degrees of integration of FSTDs and should support the development of a training program in which appropriate aircraft and FSTDs are used to ensure optimal transfer of learning enabling trainees to move seamlessly through different components of the learning environment to the work environment. The more the learning environment equates to the work environment the better. In this context it is obviously ideal, although not essential, to introduce the highest level of FSTD fidelity possible, resources permitting (Type VII). However, resources will limit this option in many ATOs.

**Type-specific FSTD in Phase 3 or not?**

MPL Phase 3 learning outcomes are not designed to be specific to type, and can be generic. While the highest fidelity FSTD (Type VII) typed to MPA would be the ideal but expensive, the Type VI FSTD example indicated in the summary matrix for MPL Phase 3 training in ICAO Doc 9625 Edition 3 offers a means, but not the only means, by which the FSTD specifications support the training outcomes. The underlying task analysis indicates the possibility to meet competency outcomes by a combination of training in the Type V and Type VII FSTD examples. The summary of the Type VI device example is deliberately “greyed out” to reflect the fact that the training community is at the time of publication uncertain about the optimal training device for this phase.
[ICAO Annex 1 – Personnel Licensing including the guidance material and the JAA/EASA-FCL rules also differ on the issue of FSTD to be applied to Phase 3. The issue is subject to the ICAO “proof of concept” mechanism which collects global MPL experiences as a basis for an update of the MPL Phase 3 device definition as soon as enough evidence is available. This is expected to happen in 2013.]

16.4 CONSIDERATIONS IN PHASE 4 (ADVANCED)

Instructors in Phase 4
TRI, SFI/FSI, TRE.

FSTDs in Phase 4

MPL Phase 4 includes, but may not be limited to, an aeroplane type rating. An appropriate combination of device specifications to meet learning outcomes is indicated in the FSTD master matrix in ICAO Doc. 9625 Edition 3, Appendix C to PART I [Note: Because of its volume the FSTD master matrix is not part of this material, but the FSTD summary matrix is shown in Attachment 7 requiring training exclusively in a Type VII device, in compliance with Annex 1, Appendix 3, Paragraph 4].

It is suggested that, whilst the MPL training programs are being introduced and validated, the highest appropriate level devices are used to facilitate the safe and efficient implementation of the MPL requirements. Note that for modern type transitions many training organizations are already using lower level devices (ICAO FSTD Type IV) prior to the students entering the full flight simulator. These transitions are proving most effective, and some are already competency-based. The use of a blend of devices has been a step-up in process because students enter FFS fully conversant with SOPs. It may therefore not be considered necessary by an NAA to apply FSTD Types VIIIs exclusively to Phase 4 of MPL.

16.5 LANDINGS TRAINING POST PHASE 4 (ADVANCED PHASE)

Competency-based LT?

It should be re-emphasized that the requirement for a certain number of exercises or hours to assure a certain competence is in contradiction to the principle of the competency-based approach to training. From the experience with MPL graduates to date, some operators ask (quite correctly) why landing training cannot be performed in line with the concept of competency-based training. However earlier industry inputs to the program lead to the current requirement for 12 takes-offs and landings in the ICAO MPL document. Under the competency-based approach, the observed performance of the student by the LT instructor should be sufficient, and for this reason, the European MPL Advisory Board [at meeting #7 on 24/25 November 2010] proposed that the take-off and landing issue be reviewed and be put on the agenda for future EASA rule making.
Current requirements and conditions:

EASA: Under the current JAR FCL [Amendment # 7 / EASA Part FCL] requirement, a minimum of 12 Take-offs and Landings between MPL skill test and the IOE phase are required.

ICAO: Alternatively, ICAO PANS-TRG recommends 12 take-offs and landings, but allows for a reduction to a minimum of 6 take-offs and landings subject to:

   a) the approved training organization has demonstrated to the satisfaction of the Licensing Authority that it does not negatively affect the acquisition of the required skill by the student, and

   b) a process is in place to ensure that corrective action can be made if in-training or post-training evaluation indicates a need to do so. (PANS-TRG Chapter 3.3.4 and 3.3.5)

Non-EASA MPL Providers: Some NON-EASA MPL providers follow PANS-TRG. CAAC requires a minimum of 20 take-offs and landings before entering the IOE phase.

16.6 MPL LT PERFORMANCE FEEDBACK

General feedback on LT

All operators who have MPL graduates flying in their line operation report unanimously that the students' performance during the take-offs and landings were on average better compared to the graduates who were trained along the traditional ab-initio route.

Note: The question whether some or all of the landings should be full stop landings with taxi back for take-off can be answered as follows: the distribution between touch and goes and full stop landings should be such that the student gains experience in the correct handling techniques from after touch down until arriving at taxi speed to an extent necessary to assure sustained repetition.

Specific feedback on LT

A public quote from a foreign inspector who observed base training in China at both China Eastern and Xiamen Airlines (one of the earliest MPL programs): “Each of the 6 candidates exhibited skills far beyond what I expected of pilots with just 250 odd hours of total experience (this early trial allocated higher hours). In fact their abilities were consistent with (and in some cases exceeding) that of crews I have observed with years of experience on type.”
SECTION 17
REGULATORY STATUS – MPL

This section summarizes how the major regulators of the world have transposed ICAO MPL regulations into their own requirements.

The table below lists all states which have adopted MPL regulations:

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ICAO

The basis of National Regulations:

- ICAO Annex 1 (10. edition) Chapter 2.5 Appendix 2 and 3 and Attachment B
- PANS – Training (DOC 9868)
- PANS – Training is complementary to the Standards and Recommended Practices (SARPS) of Annex 1 and provides for a harmonized implementation of the multi-crew pilot license

This is more than just guidance material; it has a higher level of adherence for states and will be amended subject to sufficient experience with the new kind of training. Eventually parts of PANS-TRG may enter into Annex 1 as SARPS on condition once mature.

(ICAO Material is available for sale on [www.icao.int](http://www.icao.int)).
Joint Aviation Authorities (JAA) has been an associated body of the European Civil Aviation Conference (ECAC) representing the European Civil Aviation Regulatory Authorities.

With the support of the European Authorities, JAA drafted many JARs (Joint Aviation Regulations) which were accepted (sometimes with changes) by the European States.

Among those JARs is JAR-FCL 1 which in Amendment 7 contains MPL requirements. JAR-FCL 1 including Amendment 7 is currently in the process of transposition into EASA Part FCL.

This process has to be completed by 08 April 2012 at the latest and will be binding law in the European States whenever it is finished.

The European Aviation Safety Agency (EASA) develops common aviation safety rules at the European level (Basic Regulation: European Commission No 216/2008).

Implementing Rules (IRs), Acceptable Means of Compliance (AMCs) and Guidance Material (GM) for Flight Crew Licensing and Training are in the process of being implemented.

The EASA PART FCL has to be in force on 08 April 2012 at the latest.

The Notices of Proposed Amendments (NPAs) have gone through an extensive comment phase and a Comment Response Document (CRD) was published after a short second comment period. The final result – called “EASA Opinion PART FCL” – was presented to the European Commission in August 2010.

NPA 2008-17 a/b for Pilot Licensing includes MPL under Subpart E and follows closely (except the requirement for the MPL Advisory Board) the relevant regulation in JAR-FCL Subpart K. Nevertheless, this MPL Advisory Board is continued by EASA and renamed European MPL Advisory Board.

Additional EASA requirements exceeding ICAO Annex 1 and PANS-TRG:

1. **Instructors** (See also Chapter Instructor Qualification):
   All instructors must successfully complete a MPL Instructor Training course. 
   (Attachment 5 – MPL-Instructor Training Course)
   For Flight Instructors (not TRI or SFI) in the basic phase an experience of at least 1500 h in multi-pilot operations is required. The multi-pilot experience requirement can also be met by a structured course of training (consisting of MCC qualification and 5 observer sessions in the intermediate phase of an MPL course, 5 observer sessions in the advanced phase, observations of 5 operator recurrent LOFT sessions, the content of the MCC instructor course, his/her first 5 instructor sessions being supervised by a TRI and a final assessment).
   To maintain the MPL-instructor qualification the instructor shall within the last 12 months conduct at least a simulator session of 3 hours or an 1-hour air exercise with 2 take-offs and landings; refresher training has to be performed in case revalidation is necessary.

2. **Arrangement between ATO and Client Operator**
   MPL Training courses shall only be authorized if the Approved Training Organization (ATO) belongs to a JAR OPS operator or has a specific approved arrangement with a JAR OPS operator.
3. **FSTD fidelity in Phase 3**  
   Phase 3 training requires a Level B simulator.

4. **ATC simulation** (See Section 14).

5. **The Take-offs and Landings** to finish the Advanced Phase (See Section 12.2)  
   *(For NPAs and EASA Opinion including MPL regulations see www.easa.eu, Flight Standards).*

**CAAC**

Civil Aviation Administration of China. For the time being there is only a Special Regulation for MPL training as a draft version available which is not publicly accessible.

Additional CAAC requirements exceeding ICAO Annex 1 and DOC 9868:

- For instructors in the basic phase an experience of at least 1500 h in multi-pilot operations or
- A special MPL instructor course including MCC training and three observer sessions in the intermediate and advanced phase and during loft training and line flying with a final assessment on completion
- For instructors in the intermediate phase the a.m. requirements and additionally a co-pilot rating on the relevant aeroplane
- If not fulfilling the current requirements (a simulator session of 3 hours or 1 hour air exercise with 2 take-offs and landings), a refresher training has to be performed
- Training is increased from 240 to **325 hours**, with at least **95 hours actual flight**
- **Implementation monitoring** by CAAC through supervision and exchange of information between Authority, ATO and operator being involved in the MPL training takes place
- In phase 2 a minimum of **15 hrs PF in a high performance aeroplane** is required

**CASA**

Civil Aviation Safety Authority, Australia. MPL regulations are in Civil Aviation Order (CAO) 40.1.8 and Civil Aviation Advisory Publication (CAAP) 5.216-1(0) MPL (aeroplane).


Additional CASA requirements exceeding ICAO Annex 1 and DOC 9868:

- A special **MPL instructor course** in MCC, TEM and CRM and suitable experience in multi-pilot operation
- **Achievement records** to document continuous assessment
- **Implementation monitoring** by CASA through supervision and exchange of information between Authority, ATO and operator being involved in the MPL training
- There is **no requirement for a sophisticated and realistic ATC environment** during simulator training (ICAO DOC 9868)
The ICAO language proficiency level 3 is a difference to ICAO Annex 1 for a multi-crew pilot operating internationally

**TCCA**

Transport Canada Civil Aviation.


Additional TCCA requirements exceeding ICAO Annex 1 and DOC 9868:

- A well specified grading system
- All ATOs have to undergo a beta testing process, even if the proposed MPL syllabus has already proven to be effective in producing the desired results
- ATOs shall maintain and analyze each MPL candidate and obtain feedback from employer covering a period of at least one year and performance reports on no less than two proficiency checks

There is no requirement for a sophisticated and realistic ATC environment during simulator training (ICAO DOC 9868). TCAA requires a minimum of 6 take-offs and landings.

**CAD Hong Kong (HKCAD)**

Civil Aviation Department Hong Kong, China.


Additional HKCAD requirements exceeding ICAO Annex 1 and DOC 9868 [placed on the first Beta Trial: OAA and Dragonair]

- A requirement for the student to attain and be issued with a PPL to enable LT on MPA
- A requirement to comply with existing initial Twin and Instrument ratings via a twin engine light training aircraft

**CAD Maldives**

Civil Aviation Department – Maldives

See: [www.aviainfo.gov](http://www.aviainfo.gov)

Maldives MPL regulations in CAR Part 1 Chapter 2 coincide with ICAO Annex 1 (SARPS) and DOC 9868. There are neither any deviations from ICAO Annex 1 SARPS nor additional requirements.
GCAA

General Civil Aviation Authority, UAE.

See: www.gcaa.ae

Civil Aviation Advisory Publication (aeroplane) 37 (CAAP 37), effective date 1st August 2010 provides information and GCAA policy regarding the multi-crew pilot license.

CAAP 37 is based on reference documentation in existence and publications from ICAO, the JAA and EASA.

There are neither any deviations from ICAO Annex 1 SARPS nor additional requirements.
SECTION 18
PROOF OF CONCEPT – MPL

To prove the concept of this new approach to ab-initio pilot training ICAO has encouraged contracting States to ensure proper implementation of MPL by establishing seamless communication and exchange of experience during the implementation phase of MPL around the globe, and to feed the results into the ICAO MPL “Proof of Concept” mechanism to facilitate a global exchange of best practices.

Advisory Boards:
As a consequence EASA (in 2007) and Transport Canada (in 2010) have installed so called MPL Advisory Boards. Thailand is about to do the same.

The Advisory Boards convene once or twice a year to process the data from MPL courses within their range of authority and publish the results on their respective home pages.

Advisory Board meetings – EASA:
The 3rd European MPL Open Forum was held on 23/24 November 2010 in Cologne.
The 7th European MPL Advisory Board Meeting was held on 24/25 November 2010 in Cologne.

Transport Canada:
The 1st TC MPL Advisory Board Meeting was on 01/02 June 2010 in Moncton, NB. (Results are available via TC homepage, search for > MPL > Advisory Board).
APPENDICES COVERING MPL COURSES IN OPERATION
APPENDIX 1 – AIR ASIA – CAE

General
The first trial course started in cooperation with Air Asia, a Malaysian A320 operator in March 2010 with 12 students who graduated in June 2011. A second course with 12 students is in progress. For Phase 1 and 2 training CAE contracted the Moncton Flying College (MFC) in Canada.

Phase 3 is conducted in the CAE Global Academy affiliation in the US and Phase 4 in Toronto, Canada.

The students are Malaysian nationals and mutually selected by CAE and Air Asia.

Regulatory Background
The course will be approved by phases based on a temporary Special Permission by Transport Canada (TC) which based on TC MPL regulations which are work in progress and planned to be fully implemented during the year 2011.

The Malaysian CAA has an agreement with TC to validate the Canadian MPL after graduation.

Locations
Ground School and Phase 1 and 2 training is conducted in Moncton, New Brunswick, Canada.

Phase 3 training is conducted at the CEA Simulator Training Center in Dallas, Texas and Phase 4 in the CAE Simulator Training Center in Toronto, Canada.

Instructors
Training in Phases 1 and 2 are delivered by MFC Flight Instructors.

Training in Phase 3 on Beech Jet FSTDs and in Phase 4 on A320 FSTDs will be provided by CAE Instructors (TRIs and SFIs).

Specifics
The CAE/Air Asia MPL course uses small, single engine, single pilot, propeller driven, straight wing airplanes in Phase 1 and Phase 2, starting to operate along multi-crew operation principles in Phase 2.

Phase 3 training uses Beech Jet training devices (FTD and FFS).

Phase 4 is conducted on A320 training devices (FTD and FFS).

Feedback on students/graduates performance during the skill test, base training, IOE phase and after first line check.

Not yet available.
Guidance Material and Best Practices for MPL Implementation

APPENDIX 2 – AIR BERLIN – TFC KAEUFER

General
The Pilot School TFC has a long tradition in ab-initio pilot training and has started the first MPL course in cooperation with Air Berlin in May 2008.

In the meantime they have 152 students in several courses with 72 graduated, from which 45 have successfully finished the IOE phase and are fully qualified as F/Os in Air Berlin’s A320 operation. The plan is to continue MPL training with a rate of 50 to 70 student pilots per year.

Regulatory Background
JAR-FCL Amendment # 7 in transposition into EASA Part FCL during 2011.

Locations
Ground school and Phases 1 and 2 practical training are delivered in Essen/Muehlheim, Germany.

Phases 3 and 4 training is conducted in the LFT Simulator Training Center in Berlin on A320 FSTD ICAO Level VII.

Instructors
Phase 1 and 2 training is delivered by TFC flight instructors and contracted instructors with multi-crew operation experience. Training in Phases 3 and 4 is delivered by Air Berlin TRIs and SFIs.

All instructors have successfully passed a MPL (A) Instructors Training Course according to JAR-FCL 1.310 (d) (iii) which was developed in-house.

Specifics
The TFC/Air Berlin MPL uses single- and twin-engine, single pilot, propeller driven, straight wing airplanes in Phase 1 and switches in Phase 2 into a realistic multi-crew operation training by using a B737 specific FSTD corresponding to a FNPT II/MCC (JAR nomenclature).

Feedback on the students/graduates performance during the skill test, base training, IOE phase and after check out.

All graduates showed a solid performance; especially knowledge and application of SOPs, MCC and also manual airplane control was found to be excellent compared to previous ready/direct entry pilots.
APPENDIX 3 – AIR CHINA – CAFUC

General

The Civil Aviation Flying University of China, located in Guanghan near Chengdu in the Sichuan Province, was founded in 1954 and was accredited as a University in 2000. It educates all types of aviation professionals including pilots, flight attendants, E&M and ATC personnel.

It trains around 8,000 aviation professionals per year. This includes pilots, flight attendants, maintenance and ATC personnel.

CAFUC provides ab-initio pilot training from the very beginning and has successfully trained more than 10,000 pilots for nearly all Chinese carriers in a four year educational program.

After a thorough preparation which was conducted in close cooperation with CAAC during 2007 and first half of 2008, CAFUC started the first trial course for future A320 co-pilots in summer 2008 and the second trial course in April 2010, 12 students each.

The first course which had one student dropping out, has finished all 4 phases of MPL training and successfully conducted Base Training on A320 (20 TOs & LDGs each student). The 11 graduates started the IOE phase in Air China’s Southwest branch A320 line operation in fall 2010.

The second course is in progress.

A third course with 12 students for China Eastern Operators (6 on A320 and 6 on B737) was planned to start in 2011.

Regulatory Background

The statutory basis for the Chinese MPL is the Special Regulation for the Multi-Crew Pilot License. It was developed by a CAAC/CAFUC Working Group enlarged by European training expertise during 2007 and endorsed on 19 December 2007. It is based on ICAO Annex 1, PANS-TRG and JAR-FCL Amendment # 7 Subpart K and the relevant Appendix 1.

This method leaves room for alternative means of compliance.

After evaluation of the trial courses the material will be transposed into firm regulations in CCAR Part 61. This can be expected to happen not before 2012.

Locations

Subject to the airplane type and simulator availability the complete MPL can be conducted at CAFUC in Guanghan. Alternatively Phases 3 and 4 will be conducted in simulator training centers of the operator which has hired the future graduates.

Phases 1 and 2 are conducted without exception in Guanghan and its three major satellite training airports.

Instructors

Phases 1 and 2 training is delivered by CAFUC instructors with multi-crew operation experience. Especially in Phase 2 they use instructors with SFI background on A320 and B737.
Training in Phases 3 and 4 is delivered by TRIs and SFIs.

All instructors had successfully passed a MPL (A) Instructors Training Course according to JAR-FCL 1.310 (d) (iii) which was developed and delivered by Airbus.

**Specifics**

The Chinese MPL is very similar to the Lufthansa MPL and includes 15 hours high performance jet airplane training per student in Phase 2 (CESSNA CJ 1) after 104 hrs of training per crew in a CJ 1 FFS.

50 % of Phase 3 and Phase 4 are provided in a type specific Full Flight Trainer (no motion).

MPL courses 1 and 2 are conducted in cooperation with Airbus Training which provided the MPL Instructor Training Course and the courseware and instructor preparation for Phases 3 and 4.

**Feedback** on the students/graduates performance during the skill test, base training, IOE phase and after check out.

Not yet available.
APPENDIX 4 – CHINA EASTERN/XIAMEN – ALTEON  
(NOW BOEING TRAINING)

General

This was the second MPL trial course worldwide. It was conducted in Brisbane/Australia by Alteon Training by an affiliation of the Boeing Company with 6 Chinese students during 2007 and 2008 for B737 operation. Alteon contracted the Phase 1 and Phase 2 training from a local training entity which was experienced in providing integrated ab-initio pilot training.

There was no follow up course.

The applicants were mutually selected in China.

After the successful completion of the course 3 students were provided to China Eastern Operators which transferred them further to a regional CEA branch in the northern part of China. 3 students went to Xiamen Airlines.

Regulatory Background

The course was approved by CASA (the Australian Civil Aviation Safety Authority) based on temporary CASA MPL regulations which differ from ICAO Annex 1 and PANS-TRG in the definition of Competency Units, elements, sub-elements and the relevant performance criteria. The agreement with CAAC (the Chinese Civil Aviation Authority) was:

- to have CASA and CAAC evaluators attending the MPL/TR skill test together
- to provide a CASA MPL and
- to have it validated/acknowledged by CAAC in a second step

Locations

Phases 1 and 2 were conducted at a contracted local pilot school experienced in the provision of integrated ab-initio training. Phases 3 and 4 were conducted in the Boeing Simulator Training Center in Brisbane.

Instructors

In Phases 1 and 2 instructors from the contracted local Flying College were used which were prepared and familiarized with the characteristics of competency based training by Alteon. Phases 3 and 4 training was provided by Alteon TRIs and SFIs with multi-crew operation experience.

Specifics

This trial course provided Chinese nationals with an Australian MPL which had to be endorsed by CAAC to enable the graduates to fly CAAC registered airplanes.

Alteon had to extend the training in Phase 1 several times mostly due to lack of the Chinese student’s English language proficiency.
Alteon used Boeing crew coordination and cooperation schematics throughout all phases of training, even in Phase 1.

**Feedback** on the students/graduates performance during the skill test, base training, IOE phase and after check out.

The performance of all 6 students during the MPL/TR skill test which was taken by CASA examiners and observed by CAAC examiners was very good. The same was reported from the performance during the Base Training.

The real problem was the fact that the accepting operators were by no means prepared to integrate the MPL graduates. They treated them according to the old scheme which meant:

- A substantial amount of time serving as an additional crew member (jump seat)
- A substantial amount of time serving as Pilot not Flying (PM)

Before the new hires were allowed to act as pilot flying (PF), thus substantially interrupting the novice to expert transfer.

There is no reliable date on their further professional career available.
APPENDIX 5 – CITY AIRLINE/SKYWAYS – L.U.S.A

General
Lund University School of Aviation, experienced in traditional integrated ab-initio training, provides the MPL plus a bachelor degree in aviation management in a 3 year program. The first MPL course started early 2008 with students for 2 different operators (EM 145 and F 50).

As of December 2010 L.U.S.A has a total of 25 MPL students. The next course with 12 students was planned to start in May 2011.

The first 13 students passed the MPL/TR skill test and base training in January 2010 and started the IOE phase with the relevant Operator. They are checked out in the meantime and have accumulated around 500 hrs in line operation.

Regulatory Background
On temporary approval by the Swedish CAA based on JAR-FCL Amendment # 7 Subpart K.

Locations
No info available.

Instructors
FIs with multi-crew experience in Phase 2. TRIs/SFIs in Phases 3 and 4.

Specifics
L.U.S.A. uses single engine, single pilot, propeller driven, straight wing airplanes in Phase 1 and switches in Phase 2 into a realistic multi-crew operation training.

After the successful completion of the IOE phase and the first line check the graduates will fly half time for their respective operator to finalize their studies and to receive their bachelor degree in Aviation Management.

Feedback on the students/graduates performance during the skill test, base training, IOE phase and after check out.

All 13 graduates showed outstanding performance during the skill test, base training and the IOE phase.
APPENDIX 6 – FLYBE – FTE/OAA

General
Flybe, a UK Dash 8 operator entered into MPL training early 2009 and has contracted Flight Training Europe in Spain (FTE) and the Oxford Aviation Academy in UK (OAA) to provide Phases 1 and 2 training to 6 students each.

The 6 FTE students graduated in November 2010 and started the IOE phase on Dash 8. The 6 OAA students will graduate mid-2011.

Both providers have started a second course with 6 students each.

Regulatory Background
Temporary approval by the UK CAA based on JAR-FCL Amendment #7 in transposition into EASA Part FCL during 2011.

Locations
The FTE courses are conducted in Jerez, Spain (Phases 1 and 2) and in the UK (Phases 3 and 4).

The OAA courses are conducted entirely in the UK.

Instructors
In Phases 1 and 2 conducted by flight instructors of the contracted ATO (in case of FTE also in Phase 3). Phase 3 and 4 training conducted by Flybe TRIs and SFIs.

All instructors had successfully passed a MPL (A) Instructors Training Course according to JAR-FCL 1.310 (d) (iii) which was developed in-house.

Specifics
In both cases the Flybe MPL courses use small, single and twin engine, single pilot, propeller driven, straight wing airplanes in Phase 1 only and provide training in a realistic multi-crew operation environment from Phase 2 on by using capable FSTDs.

Feedback on the students/graduates performance during the skill test, base training, IOE phase and after check out.

Above average.
APPENDIX 7 – LUFTHANSA/GERMAN WINGS/CITY LINE – LFT

General

Lufthansa Group Airlines/Lufthansa Flight Training (LFT) switched from traditional integrated ATPL ab-initio training to MPL in March 2008 with 24 students per course starting a course every 5 weeks adding up to 240 students per year. Due to expected substantial growth in 2011 and onwards the number of students per course will be increased to 30 in 2011.

The preliminary approval of the first courses by the German NAA (LBA) was transferred into a temporary approval after the German FCL came into effect in February 2009, based on JAR-FCL Amendment # 7. After completion of the first couple of MPL courses and the assessment of the results which is expected to happen mid 2011 the approval will be extended with a renewal term of 3 years.

Regulatory Background

Temporary approval by the LBA (German National Aviation Authority) based on JAR-FCL Amendment # 7 in transposition into EASA Part FCL during 2011.

Locations

Phase 1 is conducted in the LFT US training facility in Goodyear near Phoenix, Arizona.

Phase 2 is conducted at the LFT pilot school in Bremen and Phases 3 and 4 are conducted in the LFT Sim. Trg. Centers in Frankfurt or Berlin.

Instructors

Phase 1 in Phoenix is provided by US Flight Instructors under supervision of the LFT Head of Training.

The FAA rated US instructors are carefully selected, thoroughly familiarized with the JAR-FCL Subpart H requirements and endorsed by the German Aviation Authority to instruct for the acquisition of a JAA license.

Instruction in Phase 2 is delivered by LFT instructors with multi-crew operation experience and by active Lufthansa line pilots who hold an instructor rating or at least an instrument instructor rating and are delegated to Bremen for the duration of the complete Phase 2. Phases 3 and 4 are delivered by Lufthansa/German Wings/City Line TRIs and SFIs.

All instructors have successfully passed a MPL (A) Instructors Training Course according to JAR-FCL 1.310 (d) (iii) which was developed in-house.

Specifics

The Lufthansa MPL provides 15 hours high performance jet airplane training per student in Phase 2 (CESSNA CJ 1+) after 120 hrs of training per crew in a type specific FNPT II/MCC.

Feedback on the students/graduates performance during the skill test, base training, IOE phase and after check out.
Because of the waiting list which built up during the 2008/2009 downturn the courses were delayed. As of December 2010, 50 candidates have successfully passed the MPL/TR skill test (80% on A320 and 20% on B737). 40 graduates have conducted the Base Training (12 TOs and LDGs minimum) so far and will start the IOE phase in February 2011. The first 19 graduates went to German Wings, a member of the Lufthansa Operator Group, which had a vacancy and started IOE on A320 in July 2010. The TREs who conducted the Base Training reported unanimously that the student's performance during the TO and LDGs were at least as good as their predecessors which came along the traditional Lufthansa ab-initio training route. Actually the required minimum number of TOs and LDGs could be slightly reduced.

Additionally, the LH Training Quality Management is conducting a structured comparison between the last 8 graduates from the traditional ab-initio integrated CPL course, and the first 8 graduates from the first LH MPL course. The same instructors assessed the students’ performance along defined measurement criteria during a) the Type Rating versus MPL Phase 4 and b) the base Training and will assess the performance during the IOE phase and the first 6 month after check out.

The MPL candidate’s performance during the Base Training was slightly better compared to the performance of the graduates which were trained along the traditional route.

**Reliable feedback concerning the graduates’ performance during IOE and after check out is expected to be available end of 2011 and included in the next edition of this Guidance Material.**
APPENDIX 8 – STERLING – CAPA

General
Center Air Pilot Academy (CAPA) in Roskilde near Copenhagen started the worldwide first MPL trial course in 2006 with 4 students for B737 NG. CAPA had to stop MPL training in 2009 after course # 4 and altogether 19 students due to seizure of STERLING operations. The students were all Danish Nationals. After a substantial period of unemployment all graduates are flying in air carrier operations in the meantime.

CAPA has a long tradition in ab-initio integrated training and is run by an active SAS Check Captain.
All applicants had to undergo a thorough aptitude testing program before starting the course.

Regulatory Background
The trials were based on regulatory draft material and strongly supported by the Danish CAA which in turn played a pivotal role in the transposition of ICAO Annex 1 MPL and PANS-TRG content into JAR-FCL Amendment # 7 during 2006.

Locations
Phase 1 and 2 are conducted at CAPA’s home base Roskilde Airport near Copenhagen/Denmark. Phase 3 and 4 are conducted at the nearby SAS Sim Training Center.

Instructors
In Phase 1 and 2 CAPA flight instructors were used (Phase 2 instructors have multi-crew operation experience). Phase 3 and 4 training was provided by STERLING TRIs and SFIs. All instructors had successfully passed a MPL (A) Instructors Training Course according to JAR-FCL 1.310 (d) (iii), which was developed in-house.

Specifics
The CAPA MPL course uses small, single engine, single pilot, propeller driven, straight wing airplanes in Phase 1 only and provides training in a realistic multi-crew operation environment from Phase 2 on by using capable FSTDs. The small size and the relatively long course duration supported student’s learning effectiveness and gave the head of training the chance to supervise every single student’s learning progress very carefully. Diversions from the envisioned learning path were detected early and necessary corrections initiated in due course.

Feedback on the students/graduates performance during the skill test, base training, IOE phase and after check out.

The D-CAA examiner who observed the Skill test, the Sterling TRI who facilitated the 12 TO and Landings on B737 NG aeroplane and the Head of Training who supervised the IOE phase and subsequent line operation of the first 10 graduates (who had the chance to finish the IOE and to acquire up to 700 line flying hrs before STERLING stopped its operation) reported unanimously that the performance of all candidates was at or above average in all relevant interpersonal and technical skills including manual airplane control.
APPENDIX 9 – SWISS AIRLINES – SAT

General
Swiss Aviation Training (SAT) is 100% owned by Swiss Airlines which in turn belongs to the Lufthansa Airlines Group.

SAT exists since 1951 and is one of the oldest and most experienced ab-initio training organizations in the world and has successfully trained more than 2000 pilots for air carrier operation.

The first MPL course with 7 students started February 2007. Since then SAT/Swiss runs 2 MPL courses per year (alternating with traditional courses) having started MPL course # 8 in April 2010, all bound for A320.

The first MPL students graduated in September 2008. As of May 2011 there are 133 MPL students enrolled and 55 graduates checked out on A320.

All applicants have to undergo a thorough aptitude testing program before starting the course.

Regulatory Background
The first courses were conducted on a temporary approval by the Swiss Aviation Authority based on JAR-FCL Amendment # 7 in transposition into EASA Part FCL during 2011. An effective feedback loop from the ATO/Operator to the NAA is installed.

Locations
Phase 1 is contracted with Flight Safety in Florida supervised by the SAT Head of Training.

Phases 2, 3 and 4 are conducted at the SA Training Center in Zurich/Switzerland.

Instructors
Phase 1 in Florida is provided by US Flight Instructor. These instructors are carefully selected and thoroughly familiarized with the JAR-FCL Subpart H requirements and provide training exclusively to the SWISS students.

Instruction in Phases 2, 3 and 4 is delivered by SAT instructors and SWISS TRIs and SFI. All instructors had successfully passed a MPL (A) Instructors Training Course according to JAR-FCL 1.310 (d) (iii) which was developed in-house.

Specifics
The SAT/SWISS MPL course small, single and twin engine, single pilot, propeller driven, straight wing airplanes in Phase 1 only and provides training in a realistic multi-crew operation environment from Phase 2 on by using capable FSTDs.

From August 2010 the training in Phase 3 will be conducted on A320 FSTD instead of EM 145 FFS.

Adaptation of the traditional integrated ATPL courses towards the principles of MPL is in progress.
Feedback on the students/graduates performance during the skill test, base training, IOE phase and after check out. Compared to the graduates from their traditional integrated ATPL courses the MPL graduates show better performance in the field if MCC. The application of the technical KSAs is the same or better.

The average TO & Ldgs (Base Trg) before start of IOE is 16 per student.

Swiss is highly satisfied with the performance of their MPL graduates.
Guidance Material and Best Practices for MPL Implementation

APPENDIX 10 – TIGER AIRWAYS – STAA

General

After a one year preparation Singapore Technologies Aerospace Academy (STAA) started the first MPL trial course December 2009 in cooperation with the Temasek Polytechnic in Singapore (ground school) with 6 students for Tiger Airways a Singaporean A320 operator.

All students are Singapore Nationals.

The thorough selection process including aptitude testing and was facilitated in cooperation with the Singaporean Airforce.

The MPL/TR skill test is planned to occur in July 2011 with the IOE phase starting in August 2011.

A second course with 6 participants is in the planning stage.

Regulatory Background

Ground school and Phase 1 were approved by CAAS in September 2009 based on ICAO MPL SARPS and PANS-TRG. Further approvals followed stepwise.

Locations

Ground school modules are conducted in the Temasek Polytechnic in Singapore.

The Phase 1 (core flying phase) started in September 2010 in STAA’s own pilot school in Ballarat near Melbourne/Australia.

Phases 2 were conducted temporarily on a FFT-X A320 (Full Flight Trainer) at the Civil Aviation University of China (CAFUC) in Guanghan/China and started in February 2010. In the final stage Phase 2 training will be conducted on STAA’s own equipment in Singapore.

Phases 3 and 4 were conducted on ICAO Level VII FSTD (old LVL D) in Singapore.

Instructors

Training in Phase 1 is delivered by Australian Flight Instructors under supervision of a STAA Head of Training.

Phase 2 training is conducted by multi-crew operation experienced Flight Instructors, TRIs and SFIs.

Phase 3 and 4 is conducted by Tiger Airways TRIs and SFIs.

All stakeholders including Tiger Airways TRIs/SFIs and training management, STAA instructors and management and Temasek Polytechnic people participated in a customized MPL Familiarization Course.
Specifics

The STAA/Tiger Airways MPL course uses small, single engine, single pilot, propeller driven, straight wing airplanes in Phase 1 only and provides training in a realistic multi-crew operation setting from the onset of Phase 2 by using FSTDs which precisely corresponds with the operational environment the future graduates are expected to fly in.

Feedback on the students/graduates performance during the skill test, base training, IOE phase and after check out.

Not yet available.
The table below provides information which States have adopted MPL regulations, have approved MPL courses and which ATOs and operators perform the courses.

<table>
<thead>
<tr>
<th>States which have adopted MPL Regulations</th>
<th>States which have approved MPL Courses</th>
<th>ATO/Operator</th>
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<tbody>
<tr>
<td>Armenia</td>
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<tr>
<td>Australia</td>
<td>X</td>
<td>Alteon/Chinese Airline</td>
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<tr>
<td>Canada</td>
<td>X</td>
<td>CAE/Air Asia</td>
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<td>Chile</td>
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<tr>
<td>China</td>
<td>X</td>
<td>CAFUC/Air China</td>
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<td>Croatia</td>
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<tr>
<td>Denmark</td>
<td>X</td>
<td>CAPA/Sterling</td>
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<tr>
<td>Finland</td>
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<tr>
<td>Germany</td>
<td>X</td>
<td>a) LFT/Lufthansa, German Wings, City Line</td>
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<td></td>
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<td>b) TFC-Kaeufer/Air Berlin</td>
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<td>Ghana</td>
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<td>Greece</td>
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<td>Hong Kong</td>
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<td>Ireland</td>
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<td>Latvia</td>
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<td>Lithuania</td>
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<td>Maldives</td>
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<td>Malta</td>
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<td>Netherlands</td>
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<td>Pakistan</td>
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<td>Philippines</td>
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<td>Alpha Aviation/Cebu Pacific</td>
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<td>Poland</td>
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<td>Singapore</td>
<td>X</td>
<td>STAA/Tiger Airways</td>
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<td>Slovak Republic</td>
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<td>Slovenia</td>
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<td>Sweden</td>
<td>X</td>
<td>L.U.S.A/Avia Express, City Airline</td>
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<td>Switzerland</td>
<td>X</td>
<td>SAT/SWISS Airlines</td>
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<td>Syrian Arab Republic</td>
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<td>Thailand</td>
<td>X</td>
<td>Thai FTA/Thai Airways</td>
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<tr>
<td>United Arab Emirates</td>
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<td>Alpha Aviation/Air Asia</td>
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<tr>
<td>United Kingdom</td>
<td>X</td>
<td>a) OAA/Flybe</td>
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<td></td>
<td></td>
<td>b) FTE/Flybe</td>
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</tbody>
</table>
ATTACHMENT 1.1 GLOBAL MPL COURSE COMPARISON – DECEMBER 2010

This comparison sheet is not included in the MPL guidance manual as IATA updates to this comparison sheet now occur frequently, in line with the ramp up of MPL training globally.

The latest version of the GLOBAL MPL COMPARISON is available on request from IATA:

Contact: itqi@iata.org
ATTACHMENT 2 – SURVEY ON THE CHARACTERISTICS OF EXISTING MPL COURSES – SAMPLE

In order to evaluate existing MPL courses a set of questions has been asked to ATOs/Operators. The following table provides a guideline for a questionnaire which could be used to assess the quality of an MPL system.

<table>
<thead>
<tr>
<th>Questions</th>
<th>ATO/Operator No.1</th>
<th>ATO/Operator No.2</th>
<th>ATO/Operator No.3</th>
<th>etc.</th>
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</thead>
<tbody>
<tr>
<td><strong>PAT (Pilot Aptitude Testing)</strong></td>
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<td>Yes/No</td>
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<td>Who is responsible</td>
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<tr>
<td>Which Institution performs</td>
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<td>IATA PAT Manual in use</td>
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<tr>
<td><strong>Instructors Basic Phase</strong></td>
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<td>License</td>
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<tr>
<td>Ratings</td>
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<tr>
<td>Hrs as FO/CPT on Multi-Crew Airplane</td>
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<tr>
<td><strong>Grading System</strong></td>
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<td>Grade Sheet Core Ph.</td>
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<td>Grade Sheet Basic Ph.</td>
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<td>Grade Sheet Intem.Ph.</td>
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<td>Grade Sheet Advanced Ph.</td>
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<td>Grade Sheet IOE</td>
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<tr>
<td>KSAs used for grading</td>
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<tr>
<td>Operator IOE-KSAs used as master</td>
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<tr>
<td><strong>Feedback System in place</strong></td>
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<tr>
<td>Between operator and PAT provider</td>
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<tr>
<td>Between operator and ATO</td>
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<tr>
<td>IOE Phase included</td>
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<tr>
<td>National authority included</td>
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<tr>
<td><strong>ATC Simulation</strong></td>
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<td>How is it realized</td>
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</table>
ATTACHMENT 3 – PILOT COMPETENCIES AND KSAS

As per the ICAO definition, a competency consists of “a combination of Knowledge, Skills and Attitudes (KSAs) required to perform a task to a prescribed standard under a certain condition”.

Scenario

Let us imagine a diversion-scenario. Performing a diversion to an alternate airport is a typical complex task, which is performed by a crew under certain conditions (IMC, night, winter, possible time pressure because of the fuel situation).

In order to manage a diversion successfully the crew needs to apply a wide range of Knowledge, Skills and Attitudes.

If this diversion is finally performed in accordance to prescribed standards, i.e. SOPs, the crew can be considered as being competent to perform a diversion.

Components of competencies

The predominant components of all competencies are the KSAs. KSAs can be seen as the “assets” or “tools” necessary to enable a crew to operate safe, efficient and effective in all phases of flight.

Since the introduction of Human Factor concepts, the industry is using various similar models to describe and structure human behavior and performance.

Example past models

Model 1. Behavioral markers (University of Texas), which derived from thousands of actual flight observations, and became the basis for the LOSA (Line Operational Safety Audit) program under ICAO document 9803.

Model 2. Technical-and Non-Technical skills (Europe), eventually JAA ‘NOTECH’.

Model 3. Defines three areas of human performance, Interpersonal – Technical – Procedural; Interpersonal influencing both other areas.


Similarities between these models are self-evident. For pilots and training managers, these models serve as important aids to observe, measure, and assess human performance.

Since 2008 the ITQI working groups ‘Evidence Based Training’ and ‘Instructor Qualification’ evaluated all the systems in use, and defined an acceptable industry-wide set of KSAs.

9 KSAs for the airline industry (see attachments 3.1 and 3.2)

These KSAs can be considered state-of-the-art for use in MPL training. The availability of a worldwide harmonized set of KSAs is of great value. It supports operation, training, checking and innovation, and feeds back into selection (PAT).
Comparison of data
Operators applying the same KSAs can gather and share experience based on a standardized system and design their training accordingly. The 9 KSAs also serve as measuring dimensions for crew performance in both training and competency assessments. Grading systems in MPL courses measure the extent to which the crew is able to apply the KSAs in the right prioritization in order to manage the flight.

Different systems
While advanced airlines have developed their own KSAs / competencies over recent years, and are in some cases committed to tailored data collection and analysis systems in the process, the ITQI-developed KSAs can be seen as ‘average’ and ‘acceptable’ to the airline industry overall.

Translations of competencies into a global standard
KSAs world-wide are not hugely different, as those required to operate an airliner safely are largely the same, regardless of crew origin. While exact wordings may differ, over time it will be possible to translate individual airline KSAs (which differ slightly), into the exact meaning of the ITQI KSAs, which are soon to be adopted under ICAO PANS-TNG.

ITQI – the new safety tool
Performance data collection and translation (into a common competency format) will lead to a common elevated standard of global training practices, linked to actual operational performance. This will be of immense value to the airline industry. Over the past decade, the IATA Operational Safety Audit (IOSA) has already demonstrated what is possible using a common approach to airline safety standards, by delivering remarkable safety dividends to IATA airline members, and in turn to the travelling public. Now ITQI / MPL promise to lift the bar to the next level.
ATTACHMENT 3.1 PILOT COMPETENCIES AND KSAS

The Terminal 9 KSAs (TEM Elements):

- Demonstrate communication: COM
- Demonstrate manual aircraft control: MAC
- Demonstrate situational awareness: SAW
- Demonstrate leadership and teamwork: LTW
- Demonstrate flight management, guidance and automation: FMG
- Demonstrate application of procedures and knowledge: APK
- Demonstrate aeronautical knowledge: KNO
- Demonstrate workload management: WLM
- Demonstrate problem solving and decision making: PSD
<table>
<thead>
<tr>
<th>KSA</th>
<th>Code</th>
<th>Description</th>
<th>Performance Indicator (Observable crew behavior)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Situation Awareness</td>
<td>SAW</td>
<td>Awareness of the aircraft state in its environment projects and anticipates changes</td>
<td></td>
</tr>
<tr>
<td>Manual Aircraft Control</td>
<td>MAC</td>
<td>Maintains control of the aircraft in order to assure the successful outcome of a procedure or maneœuvre</td>
<td></td>
</tr>
<tr>
<td>Leadership and Teamwork</td>
<td>LTW</td>
<td>Uses appropriate authority to ensure focus on the task and crewmember concerns. Supports others in completing tasks</td>
<td></td>
</tr>
<tr>
<td>Flight Management, Guidance and Automation</td>
<td>FMA</td>
<td>Proficient and appropriate use of flight management, guidance and automation including transitions between modes, Monitoring, mode awareness and vigilance. Flexibility needed to change from one mode to another</td>
<td></td>
</tr>
<tr>
<td>Application of Procedures &amp; Knowledge</td>
<td>APK</td>
<td>Application of procedures according to published (operating instructions)</td>
<td>See IATA ITQI Evidence Based Training</td>
</tr>
<tr>
<td>Communication</td>
<td>COM</td>
<td>Demonstrates effective use of language, responsive feedback; plans are stated and ambiguities resolved</td>
<td></td>
</tr>
<tr>
<td>Knowledge</td>
<td>KNO</td>
<td>Knowledge and understanding of relevant information, operating instructions, aircraft systems and the operating environment</td>
<td></td>
</tr>
<tr>
<td>Workload Management</td>
<td>WLM</td>
<td>Prioritizes delegates and receives assistance to maximize focus on the task. Continuously monitors the flight progress</td>
<td></td>
</tr>
<tr>
<td>Problem Solving and Decision Making</td>
<td>PSD</td>
<td>Detects deviations from the desired state, evaluates problems, identifies risk, considers alternatives and selects the best course of action. Continuously reviews progress and adjusts plans.</td>
<td></td>
</tr>
<tr>
<td>Competency</td>
<td>Competency Description</td>
<td>Performance Criteria – observable behaviour*</td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
</tbody>
</table>
| Demonstrates the application of procedures    | Applies procedures according to published operating instructions                      | Follows SOP’s unless a higher degree of safety dictates otherwise  
Identifies and applies all operating instructions in a timely manner  
Correctly uses aircraft systems, controls and instruments  
Safely manages the aircraft to achieve best value for the operation, including fuel, the environment, passenger comfort and punctuality |
| Demonstrates effective communication           | Demonstrates effective use of language, responsiveness to feedback and that plans are stated and ambiguities resolved | Knows what, when, how much and with whom he or she needs to communicate  
Ensures the recipient is ready and able to receive the information  
Passes messages and information clearly, accurately, timely and adequately  
Checks that the other party has the correct understanding when passing important information  
Listens actively, patiently and demonstrates understanding when receiving information  
Asks relevant and effective questions, and offers suggestions  
Uses appropriate body language, eye contact and tone, and correctly interprets non-verbal communication of other crew members  
Is receptive to other people’s views and is willing to compromise |
| Demonstrates effective flight path management | Demonstrates proficient and appropriate use of flight management system(s), guidance and automation including transitions between modes, monitoring, mode awareness and vigilance and flexibility needed to change from one mode to another | Knows how and when to use flight management system(s), guidance and automation  
Demonstrates correct methods for engagement and disengagement of auto flight system(s)  
Demonstrates appropriate use of flight guidance, auto thrust and other automation systems  
Maintains mode awareness of auto flight system(s), includes engagement and automatic transitions  
Reverts to different modes when appropriate  
Detects deviations from the desired aircraft state (flight path, speed, attitude, thrust, etc.) and takes appropriate action |
| Demonstrates knowledge                         | Demonstrates knowledge and understanding of relevant information, operating instructions, aircraft systems and the operating environment | Demonstrates practical and applicable knowledge of limitations and systems and of their interaction  
Demonstrates required knowledge of published operating instructions  
Demonstrates knowledge of the physical environment, the air traffic environment including routings, weather, airports and the operational infrastructure  
Demonstrates knowledge of and compliance with applicable legislation  
Knows where to source required information |
| Demonstrates leadership and teamwork          | Uses appropriate authority to ensure focus on the task. Supports others in completing tasks | Agrees with and is clear about the team’s objectives and the crew members’ roles  
Is approachable, positive, motivating and considerate of others  
Uses initiative, gives direction and takes responsibility when required  
Anticipates other crew members’ needs and carries out instructions when directed  
Is open and honest about thoughts, concerns and intentions  
Gives and receives both criticism and praises well, and admits mistakes  
Confidently says what does what is important  
Demonstrates empathy, respect and tolerance for other people  
Involves others in planning and allocates activities fairly and appropriately according to abilities |
| Demonstrates manual aircraft control          | Maintains control of the aircraft in order to assure the successful outcome of a procedure or manoeuvre | Demonstrates manual aircraft control skills with smoothness and accuracy as appropriate to the situation  
Detects deviations through instrument scanning  
Maintains spare mental capacity during manual aircraft control  
Maintains the aircraft within the flight envelope  
Applies knowledge of the relationship between aircraft attitude, speed and thrust  
Identifies and verifies why things have gone wrong and does not jump to conclusions or make un informed assumptions  
Seeks accurate and adequate information from appropriate sources  
Perseveres in working through a problem  
Uses or agrees to an appropriate decision making process  
Applies essential and desirable criteria and prioritizes  
Considers as many options as practicable  
Makes decisions when needed, reviews and changes them if required  
Considers risks but does not take unnecessary risks  
Improves appropriately when faced with unforeseen circumstances to achieve the safest outcome |
| Demonstrates effective problem solving and decision making | Detects deviations from the desired state, evaluates problems, identifies risk, considers alternatives and selects the best course of action. Continuously reviews progress and adjust plans. | Identifies and verifies why things have gone wrong and does not jump to conclusions or make un informed assumptions  
Seeks accurate and adequate information from appropriate sources  
Perseveres in working through a problem  
Uses or agrees to an appropriate decision making process  
Applies essential and desirable criteria and prioritizes  
Considers as many options as practicable  
Makes decisions when needed, reviews and changes them if required  
Considers risks but does not take unnecessary risks  
Improves appropriately when faced with unforeseen circumstances to achieve the safest outcome |
| Demonstrates situation awareness              | Has an awareness of the aircraft state in its environment, projects and anticipates changes | Is aware of what the aircraft and its systems are doing  
Is aware of where the aircraft is and what its environment is  
Keeps track of time and fuel  
Is aware of the condition of people involved in the operation including passengers  
Recognises what is likely to happen, plans and stays ahead of the situation  
Develops "what if" scenarios and plans for contingencies  
Identifies threats to the safety of the aircraft and people, and takes appropriate action |
| Demonstrates effective workload management     | Prioritises, delegates and receives assistance to maximise focus on the task. Continuously monitors the flight progress. | Is calm, relaxed, careful and not impulsive  
Prepares, prioritises and schedules tasks effectively  
Uses time efficiently when carrying out tasks  
Offers and accepts assistance, delegates when necessary and asks for help early  
Reviews, monitors and cross-checks actions conscientiously  
Follows procedures appropriately and consistently  
Ensures tasks are completed  
Manages interruptions, distractions, variations and failures effectively |
ATTACHMENT 4 – THE INPUT-OUTPUT MODEL

This Matrix displays the Input-Output Model to explain how the “Super-Competency” TEM overarches all other competencies.

Simplified: By applying KSAs (as elements of TEM) crews become competent in all phases of flight.

<table>
<thead>
<tr>
<th>OUTPUT Competency Units 2-9</th>
<th>INPUT TEM (“Super”- Competency Unit 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground Ops</td>
<td></td>
</tr>
<tr>
<td>Take Off</td>
<td></td>
</tr>
<tr>
<td>Climb</td>
<td></td>
</tr>
<tr>
<td>Cruise</td>
<td></td>
</tr>
<tr>
<td>Descent</td>
<td></td>
</tr>
<tr>
<td>Approach</td>
<td></td>
</tr>
<tr>
<td>Landing</td>
<td></td>
</tr>
</tbody>
</table>
ATTACHMENT 5 – MPL INSTRUCTOR TRAINING COURSE

The ideal MPL instructor must be better trained to understand both airline and ab-initio training objectives. The selection and training of MPL Instructors should in general terms include the following considerations:

- More careful selection, to secure higher levels of motivation, enthusiasm, and empathy for MPL
- Career retention strategies by Airlines involved in the MPL process, to avoid high turnover at the ATO level in times of airline growth
- Effective and detailed instructor training / retraining for MPL
- Training MPL instructors in competency-based-instructional skills

MPL regulations:

ICAO: The recommendations in PANS-TRG Chapter 4 and the Attachment to Chapter 4 are general with respect to instructor qualification.

EASA: European regulations are more descriptive (JAR FCL/DRAFT EASA PART FCL material (MPL Instructor Training Course) is attached below to provide an example how to prepare instructors for their role. The main focus of this course is on familiarization of instructors with MPL regulations, competency based training and threat and error management. One possible solution is provided by the DRAFT Opinion, EASA PART-FCL Subpart J, 925, and AMC No.1 and No.2 FCL 925.

FCL.925 – Instructors for the MPL

a) Instructors conducting training for the MPL shall:

1. have successfully completed an MPL instructor training course at an approved training organization; and
2. additionally, for the basic, intermediate and advanced phases of the MPL integrated training course:
   i. be experienced in multi-pilot operations; and
   ii. have completed initial crew resource management training with a commercial air transport operator

b) MPL instructors training course

1. The MPL instructor training course shall comprise at least 14 hours of training
2. On completion of the training course, the applicant shall undertake an assessment of instructor competencies and of knowledge of the competency based approach to training. The assessment shall consist of a practical demonstration of instruction in the appropriate phase of the MPL training course. This assessment shall be conducted by an instructor examiner.
3. Upon successful completion of the MPL training course, the approved training organization shall issue an MPL instructor qualification certificate to the applicant

b) In order to maintain the privilege to conduct competency based approach training, the instructor shall have, within the preceding 12 months, conducted within an MPL training course
1. 1 simulator session of at least 3 hours; or
2. 1 air exercise of at least 1 hour comprising at least 2 take-offs and landings
d) If the instructor has not fulfilled the requirements of (c), before exercising the privileges to conduct instruction for the MPL he/she shall:
1. receive refresher training at an approved training organization to reach the level of competence necessary to pass the assessment of instructor competencies; and
2. pass the assessment of instructor competences as set out in (b)(2)

**AMC No 1 to FCL.925 – MPL instructor course**
1. The objectives of the MPL instructors training course are to train applicants to deliver training in accordance with the features of a competency based approach to training and assessment
2. Training should be both theoretical and practical. Practical elements should include the development of specific instructor skills, particularly in the area of teaching and assessing threat and error management and CRM in the multi-crew environment
3. The course is intended to adapt instructors to conduct competency based MPL training. It should cover the items specified below

**Theoretical Knowledge**

4. Integration of operators and organizations providing MPL training
   - Reasons for development of the MPL
   - MPL training course objective
   - Adoption of harmonized training and procedures
   - Feedback process
5. The philosophy of a competency based approach to training
   - Principles of competency based training
6. Regulatory framework, instructor qualifications and competencies
   - Source Documentation
   - Instructor Qualifications
   - Syllabus Structure
7. Introduction to Instructional Systems Design methodologies (See ICAO PANS-TRG Doc 9868)
   - Analysis
   - Design and Production
   - Evaluation and Revision
8. Introduction to the MPL Training Scheme
   - Training phases and content
   - Training media
   - Competency Units, elements and performance criteria

9. Introduction to human performance limitations, including the principles of threat and error management and appropriate countermeasures developed in CRM
   - Definitions
   - Appropriate behaviors categories
   - Assessment system

10. Application of the principles of threat and error management and CRM principles to training
    - Application and practical uses
    - Assessment methods
    - Individual corrective actions
    - Debriefing techniques

11. The purpose and conduct of assessments and evaluations
    - Basis for continuous assessment against a defined competency standard
    - Individual assessment
    - Collection and analysis of data
    - Training System evaluation

**Practical Training**

12. Practical training may be conducted by interactive group classroom modules, and/or by the use of training devices. The objective is to enable instructors to:
    - Identify behaviors based on observable actions in the following areas:
      - Communications
      - Team working
      - Situation awareness
      - Workload management
      - Problem solving and decision making
    - Analyze the root causes of undesirable behaviors
Debrief students using appropriate techniques, in particular
- Use of facilitative techniques
- Encouragement of student self-analysis
- Agree corrective actions with the student/s
- Determine achievement of the required competency

AMC No 2 to FCL.925 – MPL instructor’s renewal of privileges – refresher training

1. Paragraph (d) of FCL.925 determines that if the applicant has not complied with the requirements to maintain his privileges to conduct competency based approach training, he/she shall receive refresher training at an approved training organization to reach the level of competence necessary to pass the assessment of instructor competencies. The amount of refresher training needed should be determined on a case by case basis by the approved training organization, taking into account the following factors:

   1.1 the experience of the applicant.

   1.2 the amount of time elapsed since the last time the applicant has conducted training in an MPL course. The amount of training needed to reach the desired level of competence should increase with the time lapsed. In some cases, after evaluating the instructor, and when the time lapsed is very limited, the training organization may even determine that no further refresher training is necessary.

2. Once the training organization has determined the needs of the applicant, it should develop an individual training program that should be based on the MPL instructor course and focus on the aspects where the applicant has shown the greatest needs.
## GM (Guidance Material) to FCL.925 – MPL Instructors

The following table summarizes the instructor qualifications for each phase of MPL integrated training course:

<table>
<thead>
<tr>
<th>Phase of training</th>
<th>Qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line Flying Under Supervision in accordance with Part OPS</td>
<td>Line Training Captain or TRI(A)</td>
</tr>
<tr>
<td>Phase 4 – Advanced Base Training</td>
<td>TRI(A)</td>
</tr>
<tr>
<td>Phase 4 – Advanced Skill Test</td>
<td>TRE(A)</td>
</tr>
<tr>
<td>Phase 4 – Advanced</td>
<td>FSI(A) or TRI(A)</td>
</tr>
<tr>
<td>Phase 3 – Intermediate</td>
<td>FSI(A) or TRI(A)</td>
</tr>
<tr>
<td>Phase 2 – Basic</td>
<td>- FI(A)/IRI(A) + IR(A)/ME/MCC + 1500hrs multi-crew environment + IR(A) instructional privileges, or</td>
</tr>
<tr>
<td></td>
<td>- FI(A) + MCCI(A), or FI(A) + SFI(A), or</td>
</tr>
<tr>
<td></td>
<td>- FI(A) + TRI(A)</td>
</tr>
<tr>
<td>Phase 1 – Core Flying Skills</td>
<td>- FI(A) + 500hrs, including 200hrs instruction</td>
</tr>
<tr>
<td></td>
<td>- Instructor qualifications and privileges should be in accordance with the training items within the phase. STI for appropriate exercises conducted in a FNPT or BTD.</td>
</tr>
</tbody>
</table>
ATTACHMENT 6 – THE VALUE SMALL AEROPLANES (ESPECIALLY STRAIGHT-WING, SINGLE-ENGINE, PROPELLER DRIVEN (SEP) AEROPLANES) IN AB-INITIO TRAINING FOR FUTURE MULTI-CREW AIRLINE PILOTS

Note: The statements in this Attachment are condensed highlights extracted from a working paper presented by Otto Krueger to the ICAO FLIGHT CREW LICENSING AND TRAINING PANEL (FCLTP) in December 2003.
[Also refer to the airline analysis of IOE performance against hours of light aircraft in Section 2].

Introduction

Cockpit design and operation of modern civil transport aeroplane and the overall environment have changed substantially over the last three decades (e.g. two-man crew, glass cockpit, fly by wire, FMS, ECAM/EICAS, GPS, Area NAV, RVSM, TCAS). There have also been dramatic developments in training media and hardware, beginning with Computer-Based Training (CBT) with system free play, part-task trainers for FMS training, system trainers or system training and fixed-base trainers for procedures training, leading up to high fidelity full flight simulators with wide screen, high resolution visual aids. There is a common understanding in the aviation community that, in order to prevent accidents and increase flight safety, the emphasis in airline pilot training has shifted from the technical to the interpersonal aspects of airline operations.

Another major consideration that led to the establishment of the Flight Crew Licensing and Training Panel (FCLTP) in early 2002 was that the relevant SARPs impeded the full implementation of modern training designs, in respect to both methodology and hardware, in the ab-initio education of future multi-crew airline pilots.

A major change was the need to reduce training on single-engine piston (SEP) aeroplanes with its emphasis on single pilot operations, in favor of training in an environment of operational realism, through the use of FNPT II synthetic trainers and Level D jet transport simulators. It was reasoned that pilot competencies and the underpinning technical, procedural and interpersonal attributes needed for successfully operating a modern civil jet transport multi-crew aeroplane, could not be taught on a SEP aeroplane.

Discussion

The reduction of training on SEP aeroplanes was subject to intense discussion. Some of the participants identified basic flying skills as still being important to the development of future multi-crew pilots and, therefore, questioned the validity of reducing SEP aeroplane training. They claimed that a reduction would result in a critical degradation of basic flying skills. Such concerns, however, ignore the fact that, in spite of the continued importance of basic flying skills, interpersonal skills, such as threat and error management (TEM), communication, leadership, teamwork, workload management, situational awareness and structured decision making are more important to the successful handling of a system-degradation or to the occurrence of an abnormal situation in a multi-crew environment.

There is no question that future multi-crew airline pilots must have the ability to manually control a modern transport aeroplane in all maneuvers and situations. However, since the ‘stick and rudder’ skills for flying a multi-crew aeroplane are completely different to those required to handle a SEP aeroplane, they can only be acquired
in Level D simulators or in the corresponding transport aeroplane. It is not possible to train and develop these handling skills in SEP aeroplanes.

If it is agreed that, at high levels of stress, humans revert to the basics first learned for a specific task, then it stands to reason that basic training on SEP aeroplanes for the MPL is, beyond a certain level, counterproductive, if not unsafe. Swept-wing jet transport aeroplanes have very different handling characteristics to those of SEP aeroplanes in most regimes, including a substantially greater speed range, and take-off, landing and pitch and power techniques. The ab-initio student, having thoroughly learned the basic skills needed to manually control a SEP aeroplane, very often has difficulties to re-learn and acquire the completely different basic skills needed to manually control a modern transport aeroplane. The facts show that the use of SEP aeroplanes to train multi-crew airline pilots, establish basic skills which may be hazardous if reverted to, under stressful situations, whilst flying a modern transport aeroplane.

The agreement that training must be done in a sufficient amount to enable it to settle in the long term memory, also argues in favor of a substantial reduction of SEP aeroplane training for the MPL. Instead, greater emphasis has to be placed, at the very early stages of training, on the technical, procedural and interpersonal behavioral domains that are most relevant to multi-crew operations in commercial jet transport aeroplanes. Training in SEP aeroplanes should be just sufficient for the student to:

a) appreciate the feel of aerodynamic laws in the real environment
b) gain an insight into the use of aviation language, including ATC phraseology and the use of general procedures in aviation
c) recognize and ‘believe’ sensations of three dimensional movement and to develop three dimensional thinking; and
d) build underlying attitudes such as responsibility, self-discipline and self-confidence

Note: Feedback results from operators which have employed the first graduates from MPL courses confirm the correctness of the statements made in this working paper.
## ATTACHMENT 7 – FSTD SUMMARY MATRIX


<table>
<thead>
<tr>
<th>DEVICE</th>
<th>LICENCE/RATING TRAINING</th>
<th>DEVICE FEATURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type VII</td>
<td>MPL4 - Advanced</td>
<td>TP S S S S S R S R S S R R</td>
</tr>
<tr>
<td></td>
<td>TR + ATP</td>
<td>TP S S S S S R S R S S R R</td>
</tr>
<tr>
<td></td>
<td>RE Training</td>
<td>T S S S S S R S R N S R R</td>
</tr>
<tr>
<td></td>
<td>RO + IO + CQ</td>
<td>TP S S S S S R S R S S R R</td>
</tr>
<tr>
<td></td>
<td>RL</td>
<td>TP S S S S S R S R S S R R</td>
</tr>
<tr>
<td>Type VI</td>
<td>MPL3 - Intermediate</td>
<td>T + TP R R R R R R S R1 S S R R</td>
</tr>
<tr>
<td>Type V</td>
<td>TR/IO/RO/RL Training</td>
<td>T S S S S S R R N G S R R</td>
</tr>
<tr>
<td>Type IV</td>
<td>MPL2 - Basic</td>
<td>T + TP R G G R G R G N G S G R</td>
</tr>
<tr>
<td>Type III</td>
<td>CR Training</td>
<td>T R R R R R R R N N S G G</td>
</tr>
<tr>
<td>Type II</td>
<td>IR Training</td>
<td>T G G G R G G G N G S G G</td>
</tr>
<tr>
<td>Type I</td>
<td>CPL Training</td>
<td>T R R R R R G R N N S G G(S)</td>
</tr>
<tr>
<td></td>
<td>MPL1 Core Training</td>
<td>T R R R R R R1 G G N N S G G</td>
</tr>
<tr>
<td></td>
<td>PPL Training</td>
<td>T R R R R R G R N N S G R(S)</td>
</tr>
</tbody>
</table>
ATTACHMENT 8 – IATA GUIDANCE MATERIAL AND BEST PRACTICES FOR PILOT APTITUDE TESTING

This Attachment displays the Executive Summary of the PAT Manual, effective 1 June 2010.

Executive Summary

Purpose

IATA supports investments in human performance, since human factor consistently accounts for the majority of all aircraft accidents. These investments will produce the highest probability of achieving a quantifiable reduction in accident rates.

The purpose of this manual is to support the motivation and basic knowledge of aviation managers in the field of aptitude testing to an extent, enabling them to decide on and implement a practical pilot aptitude testing system in their organization. The term **Aptitude Testing** is used as hypernym within this manual, overarching all areas of aptitude diagnostics (basic abilities, specific/operational abilities, social competencies and personality traits).

Historically, military organizations and large operators with high quantities of applicants generally are the ones with access to mature selection systems. Ironically, smaller organizations, which tend to have the highest turnover of personnel, are usually least capable of developing and maintaining an effective aptitude testing process. Subsequently, over time the resulting situation may be considered a safety issue, especially as the experience pool dries up. As the airlines face industry growth once again, increasingly less numbers of experienced airline and military pilots will be available and a large number of operators will need to recruit their staff from the general aviation market.

Online Survey

With the intent to address the problem, IATA has asked the member airlines and associated operators to participate in an online survey to study present industry practices of pilot selection and support the production of this manual. The survey consisted of 91 questions covering the areas of organization/training/hiring, financial aspects and psychology and methodology.

A total of 66 institutions have completed parts of or all the survey. Major lessons learned were:

a) Accepted approach – categories used to evaluate the issue of pilot selection and the questions which were asked, were accepted and are of further use

b) Present selection systems might display a lack of conceptual basis – there is a need for conceptual support in setting up efficient selection systems

c) Strengths and weaknesses – changes made and changes desired mostly affect the methodology, not so much organization or efficiency of testing systems

d) Ready-entry pilots (low experience) are a diverse group – predicting the performance of this group seems to be especially difficult, is it most inhomogeneous and neither licenses nor flying hours can reliably describe actual pilots competency

e) Selection for Captains and First Officers is undervalued – most selection systems have been established for ab-initio candidates and they display a high degree of sophistication
Guidance Material and Best Practices for MPL Implementation

Fewer and less methodically qualified selection systems are in place for First Officers and selection systems in place for Captains display the least maturity and quality.

*Note: An airline’s safety culture cornerstone includes its First Officers and Captains therefore, investments in their professional testing are especially recommended.*

**Benefits**

Professional aptitude testing has proven to be highly effective and efficient. If correctly implemented, it can contribute to considerable cost savings for the airline. The costs associated with implementing a functional aptitude testing system are significantly lower compared to the costs of high failure rates resulting from immature selection. Benefits of sound aptitude testing include lower subsequent costs of training, higher success rates, contributions to a better working environment, positive influence on labor turnover, enhancement of the reputation of the flight operations department and the airline’s brand. An integral part of the quality assurance system of the organization the pilot aptitude testing system includes a regular evaluation; this requires data management of pilot-performance data as a collaborative effort between all involved parties (HR, Flight Operations, Training and Aptitude Testing). The performance of an aptitude testing system can be measured by evaluating the following:

a) Test reliability

b) Test validity (especially predictive validity)

c) Ratio of the selection rate (number of successes) versus hit rate (on-site success rate with regard to the test criterion)

**Regulatory Issues**

A medical examination, English language proficiency and the ability to comprehend the training course content are all ICAO requirements. Regulators worldwide have been far more reluctant in regards to personality criteria. There are some general requirements for assuring the psychological aptitude of applicants, but there is a lack of guidance material. Equal opportunity legislation, data protection rules, legal provisions for professional aptitude testing and aspects of cultural diversity have to be observed to assure fair aptitude testing.

**Aptitude Testing System**

The hiring decision should be taken by a designated selection team. In the interest of safety and fairness, and assuming that the aptitude testing system has been professionally developed, implemented and validated, the hiring decision shall be based solely on the testing result.

The design phase of an aptitude testing system requires high management attention (definition of the job requirements, application/re-application criteria, presentation of results, evaluation procedures) and the involvement of an aviation psychologist.
The following are the main measuring dimensions of pilot aptitude tests:

a) Basic abilities (intelligence)

b) Operational competencies

c) Social competencies

d) Personality traits

The least qualified testing instruments are freestyle interviews, while the highest qualified testing instruments are psychometric testing apparatus. Classic flight-simulator checks are suitable to quantify the amount of and type of training needed for selected personnel, but they are not very suitable for testing aptitude. Simulation-based testing of operational competencies can be performed best on specifically programed (PC-based) low fidelity simulators, since they provide high values of predictive validity.

Multi-Stage testing systems (less expensive screening procedures first, costly selection procedures last) are most advisable.
## ATTACHMENT 9 – MPL TRAINING SCHEME

Attachment 9 is extracted from the ICAO Document 9865 Procedures for Air Navigation page 27.

### Training

<table>
<thead>
<tr>
<th>Integrated TEM principles</th>
<th>Phase of training</th>
<th>Training Items</th>
<th>Flight and simulated flight training media - Minimum level requirement</th>
<th>Ground training media</th>
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<td>12 take-offs and landings as PF**</td>
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<td>Introduction of multi-crew operations and instrument flight</td>
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<td>• IFR cross-country</td>
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<td>Specific basic single pilot training</td>
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<td>• Principles of flight</td>
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<td>• Cockpit procedures</td>
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The IUAI Airlines Study Group recommends that the International Union of Aviation Insurers (IUAI) adopt the ICAO Procedures for Air Navigation Services – Training (PANS-TRG, Doc 9868) as its standard for airline training best practice. We make this recommendation based on the following:

1. The multi-crew pilot license (MPL) training scheme is global in its nature and has enjoyed senior international aviation community involvement throughout its development.

2. MPL establishes single minimum piloting performance specifications and standards and contemplates currently available training technology.

3. MPL development and adoption are global initiatives of the Flight Operations Group (FOG) of the International Air Transportation Association (IATA) and will, therefore, be internationally communicated and sustainable.

4. There is well-defined program development “follow-on”. Specific deliverables of the IATA FOG “Training and Qualification Initiative” include review of the applicability of existing regulations and development of global standards and best practices for:
   - MPL implementation; Instructor qualification; FSTD qualification
   - Approval criteria for training providers
   - Pre-selection criteria for pilots
   - T/R and recurrent training

The International Union of Aerospace Insurers should strive to be consistent with best practice standards developed by ICAO when they exist and are well vetted.
ATTACHMENT 11 – FREQUENTLY ASKED QUESTIONS

Why MPL?

The MPL was established to respond to the growing demand in the aviation training community that felt that the current regulatory regime that dictated a large number of flying hours in solo and on a smaller aircraft was not the most efficient and safe way to train pilots for co-pilot duties on jet transport aircraft.

Further, there was some perceived negative training in the apprenticeship model that was first developed for flight training in the post second world war era. A number of training organizations and airlines were adamant that modern training techniques and research into the use of modern training devices such as flight simulation training devices needed to be recognized within the ICAO licensing structure. The ICAO Air Navigation Commission formed a Flight Crew Licensing and Training Panel to explore the options and opportunities to address the shortcomings of some current licensing requirements. The competency-based concept and the MPL license were the outcome of that panel's deliberations.

By adopting new standards and recommendations for ab-initio airline pilot training in November 2006 ICAO cleared the way for a substantial modernization of airline pilot ab-initio training. Now best industry practice can be applied by making use of modern Instructional System Design (ISD) and the latest developments of Flight Simulation Training Devices (FSTD).

The MPL training scheme concentrates on the core competencies of pilots of modern jet transport airplane emphasizing the aspect of multi-crew operation from the early stages of the training.

It prioritizes the overarching principle of Threat and Error Management (TEM) considering the fact that the vast majority of incidents and accidents in civil aviation are caused by a lack of interpersonal skills (communication, leadership and teamwork, workload management, situational awareness and structured decision making).

Beyond that the MPL considers the threats inherent to increased automation and reduced manual flying.

Although this new approach to ab-initio pilot training is NOT driven by economic aspects, the outcome based focus will result in the reduction of training time thus leading to higher efficiency. The obvious improvement of the training quality will lead to improved safety standards in cockpit operation.

Compared to current ab-initio airline pilot training the MPL scheme shifts a substantial part of training from real airplane into Flight Simulation Training Devices (FSTD) hence reducing CO₂ emissions, noise and airspace congestion.

The MPL is a contribution to the on-going effort to preserve and improve the safety standard of civil aviation cockpit operation in view of the doubling of its volume within the next two decades.

Through PANS-TRG (Doc. 9868) the MPL is the best documented training system in the long history of ICAO Annex 1.
Where can the governing rules and guidance material for MPL be found?

a) In ICAO Annex 1 Chapter 2.5 plus Appendix 3 and Attachment B as well as in ICAO Doc. 9868 “PANS-TRG”

b) In JAR-FCL Amendment 7, Section 1, Subpart K, 1.500-1.535 plus Appendix1 to 1.520 & 1.525 (which leads to all other relevant Subparts in Section 1 and the relevant additional guidance material in Section 2). For MPL Instructors see Section 1, Subpart H, 1.310 (d) plus Appendix 1 to 1.310 (d) (which leads to further guidance material in Section 2)

<table>
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<tr>
<th>MPL regulations are adopted by the following European National Authorities:</th>
<th>In the National Aviation Regulations for:</th>
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<td>United Kingdom</td>
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(Countries marked by X are conducting MPL courses)

What is competency?
A combination of skills, knowledge and attitude required to perform a task to the prescribed standard under a certain condition.

What is Competency-based training and assessment?
Training and assessment that are characterized 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 norm.
What is a Competency Element?
An action that constitutes a task that has a triggering event and a terminating event that clearly defines its limits, and an observable outcome.

What is a Competency Unit?
A discrete function consisting of a number of competency elements.

Will every Training Organization be allowed to deliver MPL training?
No, a special approval is required according to ICAO Annex 1. Chap 1.2.8 plus Appendix 2 to Chap 1.

Is the traditional integrated ATPL course still available?
Yes.

What is the objective of Phase 1?
The core phase: Single Pilot Training in aeroplanes and FSTD to consolidate basic aeronautical knowledge in the real environment including upset recovery, basic instrument flying and night flying.

Is solo flying required?
Yes; the minimum is the requirement for PPL which is 10 hours; but most of the trial courses which have started around the world contain around 15 hours solo flight time.

Upset prevention and recovery training: Why is it necessary and in which phase should it happen?
Upset prevention and recovery training is a new element in MPL training. It serves to increase the pilot’s ability to recognize and avoid and prevent upset situations, and to improve the pilot’s ability to recover control, if avoidance is unsuccessful. In addition it should instill more confidence in core flying skills. It can be done at any time during the course, preferably to the end of Phase 1 or in Phase 2. The ideal Upset Recovery training module should consist of a set of aircraft and FSTD lessons to combine both, human sensorial aspects and flight characteristics of modern swept-wing jet transport airplane.

How many hours airplane flying is required?
35 hrs (minimum for PPL), although most of the trial courses which have started around the world contain 80-90 hrs (including solo flight time) on single engine piston airplane and around 25 hrs FNPT I for VFR preparation and basic instrument training.

Can PNF (PM) hours be credited in Phase 1?
No, because there is no Pilot Not Flying (PNF) in a single pilot operation (see question 9).

What are the requirements for a MPL holder to become Captain?
Same as today, 1500 hrs and ATPL.
Can a MPL holder fly single pilot commercial operation?
No; it requires additional training, see ICAO Annex 1, Chapter 2.5.2.3 and JAR-FCL Amendment # 7, JAR-FCL 1.510 (a) (2).

Will the MPL be globally recognized?
As a license defined by ICAO the MPL will be recognized by all ICAO Contracting States even by those that may decide not to establish an MPL as a license within their own States.

Why is the cooperation between ATO and a specific airline considered necessary for a successful MPL training?
Because from Phase 2 and onwards the training should be conducted according to the SOPs of that specific airline to secure the full benefit of the MPL concept.

What, if a MPL holder who has graduated on A320 needs to fly B737 (or Embraer or Canadair or other multi-pilot transport airplane) or vice versa?
She or he needs a regular type rating and if applicable an adaption to SOPs of the new airline.

Can previous experience be credited towards a MPL course?
No (See Appendix 1 to JAR-FCL 1.520 & 1.525, § 4).

Can previous experience acquired in a MPL course be credited towards a traditional integrated or modular ATPL course?
Yes, up to the decision of the responsible NAA (See Appendix 1 to JAR-FCL 1.520 & 1.525, § 4).

Is ATC simulation required?
Yes, in PANS-TRG recommended, in JAR-FCL a requirement for Phases 3 and 4. The industry is working on it. It can be substituted by alternate means of compliance individually approved by the NAA.

New ICAO Doc 9625 Edition 3 is recommending a grace period of 4 years to 2013.

Does a MPL instructor need special training?
Yes, in PANS-TRG recommended; in JAR-FCL a requirement (See JAR-FCL Amendment # 7, JAR-FCL 1.310 (d) (1), (2) and (3).

Does an instructor delivering training in Phase 2 need multi-crew operation experience?
Yes.

How long should a MPL course be?
Around 18 month at least in the trial phase.
Did the introduction of the multi-crew pilot license result from a need to address the projected shortage in qualified airline pilots in different parts of the world?

a) No, that would be an inaccurate assumption. Long before anyone foresaw the current shortages in qualified pilots, the aviation community recognized that the training and licensing standards in use at the time did not adequately account for the enormous advancements in technology and learning methodologies, along with the increased complexities of pilot work environments. It was for those reasons that ICAO commissioned a review, which led to the creation of a new licensing structure and improved standards that reflect today’s realities. Transport Canada endorses those changes and is taking action that will align our regulatory framework more closely with ICAO’s newly revised standards.

b) When the FCLT-Panel convened for its first meeting in 2002 the world’s civil aviation suffered from 9/11 2001 and other severe negative economic impacts; events that suppressed demand for air transport services, and hence pilot recruiting. Thousands of pilots were jobless at that time.

MPL cannot cure the shortage, but it can minimize the threats inherent during a shortage.

**Was the MPL developed to save money and time?**

The MPL initiative is NOT meant to reduce training effort and time.

The MPL initiative is NOT economy driven, but it will improve efficiency by the fact that it enhances operational safety by producing better pilots.

MPL development was driven by the fact that the 40-years old standards of Annex 1 and Annex 6 had become out of step with the evolving industry practice, the developments of simulation and of modern Instructional System Design.

**When can the EASA Part FCL (including MPL) and the related Implementing Rules be expected to be in force?**

Between 2011 and 08 April 2012. Until that time JAR-FCL Amendment # 7 is in force.

**Why is training on small, straight wing, single engine piston (SEP) airplane beyond a certain minimum counterproductive in the training process for future pilots on modern multi-crew jet transport airplane?**

*(Minutes of the discussion during the first FCLT-Panel in Montreal in December 2003).*

a) The reduction of training on SEP aeroplanes was subject to intense discussion within the Panel. Some of the participants identified basic flying skills as still being important to the development of future multi-crew pilots and, therefore, questioned the validity of reducing SEP aeroplane training. They claimed that a reduction would result in a critical degradation of basic flying skills. Such concerns, however, ignore the fact that, in spite of the continued importance of basic flying skills, interpersonal skills, such as threat and error management (TEM), communication, leadership, teamwork, workload management, situational awareness and structured decision making are more important to the successful handling of system degradation or to the occurrence of an abnormal situation in a multi-crew environment. There is no question that future multi-crew airline pilots must have the ability to manually control a modern transport aeroplane in all maneuvers and situations. However, since the ‘stick and rudder’ skills for flying a multi-crew aeroplane are completely different to those
required to handle a SEP aeroplane, they can only be acquired in type specific FSTDs or in the corresponding transport aeroplane. It is not possible to train and develop these handling skills in SEP aeroplanes.

b) If it is agreed that, at high levels of stress, humans revert to the basics first learned for a specific task, then it stands to reason that basic training on SEP aeroplanes for the MPL is, beyond a certain level, counterproductive, if not unsafe. Swept-wing jet transport aeroplanes have very different handling characteristics to those of SEP aeroplanes in most regimes, including a substantially greater speed range, and take-off, landing and pitch and power techniques. The ab-initio student, having thoroughly learned the basic skills needed to manually control a SEP aeroplane, very often has difficulties to re-learn and acquire the completely different basic skills needed to manually control a modern jet transport aeroplane. The facts show that the use of SEP aeroplanes to train multi-crew airline pilots, establish basic skills which may be hazardous if reverted to, under stressful situations, whilst flying a modern transport aeroplane.

c) The agreement that training must be done in a sufficient amount to enable it to settle in the long term memory, also argues in favor of a substantial reduction of SEP aeroplane training for the MPL. Instead, greater emphasis has to be placed, at the very early stages of training, on the technical, procedural and interpersonal behavioral domains that are most relevant to multi-crew operations in commercial jet transport aeroplanes.

Training in SEP aeroplanes should be just sufficient for the student to:

- appreciate the feel of aerodynamic laws in the real environment
- gain an insight into the use of aviation language, including ATC phraseology and the use of general procedures in aviation

What is Threat and Error Management (TEM)?

- TEM is the latest development in the long history of CRM as a successful safety concept; whereby CRM can now be seen to be the “toolkit” for a successful TEM
- TEM is an overarching pilot competency (consisting of skills, knowledge and attitude) which pervades the whole dynamic process of a flight, or a series of flights, from the very moment the crew meets at the check in counter until the completion of the shutdown checklist at the end of a duty cycle


Who delivered, delivers, or plans to deliver MPL courses; how many students for which type of airplane and who was/is the cooperating airline?

CAPA, Denmark for Sterling, 2006 to 2008, 19 graduates on B737NG. No courses at the moment.

Alteon, Australia, for Chinese airlines, 2006/2007, 6 graduates on B737NG. No courses at the moment.

Swiss Aviation Training for Swiss, started 2007, 109 students enrolled and 25 graduates (7 students in the IOE phase on A320 and 18 students checked out on A320).
CAFUC, China, for Chinese Airlines, started first trial course with 12 students in 7/2008 and a second trial course with 12 students 9/09, targeted for A320. A third course with 12 students targeted for B 737 is planned to start in 2011.

Flight School TFC-Käufer, Germany, for Air Berlin, started 5/2008, 150 student’s enrolled and 67 graduates flying A320.

Lufthansa Flight Training, for Lufthansa A 320 and B 737, for German Wings A 320 and City Line Embraer 175, started 3/2008, 10 courses per year with 20-24 students per course, > 750 students enrolled. First 5 graduates flying in line service with German Wings on A 320. More than 200 graduates expected to enter line flying during 2011.

Lund University, Sweden, for City Airline and Skyways, started in 2008, 35 students enrolled and 13 graduates flying EM 145 and F50.

FTE and OAA for Flybe, 6 students each course for Dash 8. The 6 FTE students have graduated in November 2010. The 6 OAA students have finished Phase 2.


What are the major challenges in MPL training?

a) The standardization of instructors (this is the reason why JAR-FCL Amendment 7 requires every instructors who intends to deliver MPL training to successfully complete an MPL Instructor Training Course including an assessment and the maintenance of his competencies)

b) The development of a competency-based Lesson Plan and Syllabus for all phases of the course

c) The elaboration of a Performance Norm and a Grading System, which allows 1. a continuous assessment of the students’ performance by instructors in every single lesson and 2. a course evaluation to continuously adjust the norm. This in turn requires the precise definition of the complete suite of KSAs and their performance criteria (The 9 KSAs) which the student has to acquire and to apply consistently during his Novice-to-Expert transformation process.

d) Validation of the MPL course by evaluating the observed performance of the graduates during line operation


It provides a description of the minimum technical requirements, validation and objective and subjective testing of the devices required in the different phases of the MPL training. For the first time, training equipment is prescribed to training tasks, where the industry has previously ‘made do’ with whatever equipment was ‘most closely matched’ to training requirements.
Does MPL consider the fact that increasing numbers of incidents and accidents seem to be caused by a mismatch between the crew and advanced automation leading to undesired aircraft states?

Triggering facts for the development of MPL were a) the obvious divergence between the competencies required for a successful operation of modern, multi-crew jet transport airplane and the regulatory requirements for training and b) the lack of exercise to manually control this type of airplane in normal and abnormal regimes.

The MPL training scheme covers these items by defining detailed performance criteria for a) Flight Management, Guidance & Automation and b) Manual Airplane Control.

Compared to current ab-initio training schemes the MPL training course provides 4 times more instruction time in multi-crew environment thus producing a better prepared co-pilot.

What is a multi-crew aeroplane?

It is an aeroplane that requires a flight crew of at least two pilots. One of them is the pilot-in-command (the captain) and the other is the co-pilot (or first officer). All jet air transport aeroplanes and the vast majority of turbine powered air transport aircraft and business jet are multi-crew aeroplanes. The definition in Annex 1 – Personnel Licensing states that it is: “an aircraft required to be operated with a co-pilot as specified in the flight manual or by the air operator certificate.”

Do I have to hold a MPL to be a co-pilot on a multi-crew aeroplane?

No, the co-pilot on a multi-crew aeroplane can hold either a MPL or a CPL endorsed with an instrument rating and a type rating on a multi-crew aircraft.

What are the differences between the CPL and the MPL?

For the purposes of operating multi-crew aircraft, the privileges of a MPL are equivalent to those of CPL endorsed with an instrument rating and a type rating on a multi-crew aircraft. However, and because the MPL is geared toward operation of multi-crew airplane, an MPL pilot cannot generally fly on single pilot aeroplane without meeting additional requirements. For example, MPL holders cannot exercise the privileges of a CPL and instrument ratings on single pilot aeroplane without meeting specific actual flight time and flight instruction requirements.

A number of MPL courses may be a modification of the current JAA frozen ATPL or the Transport Canada and FAA CPL/Multi-engine training, but it is expected that the majority will follow the guidance proposed in the Procedures for Air Navigation Services – Training (PANS-TRG) document.

Is it true that a MPL graduate is obliged to fly for the airline which he starts flying for after graduation?

No, he is only tied to this airline until the end of the IOE phase including the successful conduct of the first line check. In case of special sponsoring arrangements between student and client operator, it is anticipated that the client operator will enter into some form of an employment agreement with the trainee to ensure the operator receives full value from their investment.