Extract from CAP804, Part 1, Section 4, Part H, Subpart 1, Paragraph 4.3 Guidance on Differences Training

4.3 **Guidance on Differences Training**

4.3.1 **Variable Pitch (VP) Propellers (all propeller aeroplanes)**

These systems make a significant difference to performance in all phases of flight. Mostly, the instruction in this section will be given to pilots converting from SEP aeroplanes with fixed pitch propellers to SEP or MEP aeroplanes with VP propellers and constant speed units (CSU). The system on some older types may not include a CSU and instructors must ensure that all of the system differences and handling techniques, introduced by the new type, are properly covered in the training given. Differences Training completed, for this section, on an SEP aeroplane, does not provide equivalent qualification on MEP aeroplanes.

All Aeroplanes

Principle of operation and effect on performance;

System construction and function;

Propeller system limitations;

Engine limitations and instrumentation.

Operation of throttle, mixture and propeller controls, including pre-flight checks and normal handling during:

- Start up and taxying;
- Take-off and climb;
- Cruise at various power settings and speeds;
- Low speed handling and stall/spin recovery;
- Approach and go-around;
- Landing and shut down.

In-flight failures, within the propeller system, including:

- Loss of oil pressure;
- Loss of governor control;
- Overspeed;
- Underspeed.

Emergency handling, during:

- Engine failure after take-off/go-around;
- Engine failure during other phases of flight, including approach and landing;
- Effect of engine failure on glide performance.

Emergency Handling Considerations for Multi-Engine Aeroplanes

- Engine failures after take-off including propeller feathering and effect of wind-mill drag;
- Circuit and approach with one or more engines inoperative;
- Go-around with one or more engines inoperative;

- Landing with one or more engines inoperative.

4.3.2 **Retractable Undercarriage**

Differences Training completed, for this section, on an SEP aeroplane, does not provide equivalent qualification on MEP aeroplanes:

- Principle and effect on performance;
- System construction and function;
- Limitations - raising, lowering and extended.

Operation including pre-flight checks and normal handling:

- After take-off;
- On approach/go-around and landing;
- In-flight system failures and emergency lowering.

Operation of undercarriage during:

- Engine failure after take-off/go-around (Emergency raising - as applicable to type);
- Engine failure during other phases of flight, including approach and landing.
- Effect on glide performance.

Considerations for MEP Aeroplanes:

- Effect on performance – one or more engines inoperative;
- Handling during approach and landing/go-around with one or more engines inoperative;
- Effect on engine out allowance and landing committal height.

4.3.3 **Turbo/Supercharged Engine(s)**

Differences Training completed, for this section, on a SEP aeroplane, does not provide equivalent qualification on MEP Aeroplanes:

- Principle and effect on performance, including cruise altitude;
- System construction and function;
- Engine limitations and instrumentation.

Engine handling including pre-flight checks and normal operation during:

- Start up and taxying;
- Take-off and climb;
- Cruise at various power settings and speeds;
- Low speed handling and stall/spin recovery;
- Approach and go-around;
- Landing and shut down.
- In-flight failures and emergency handling;
- Single-Engine Stabilising Altitude (Multi-Engine only).

4.3.4 **Cabin Pressurisation and Oxygen Systems**

Differences Training completed, for this section, on an SEP aeroplane, does not provide equivalent qualification on MEP aeroplanes:

- Principle and effect on performance;

- Construction;
- System function including associated environmental heating and air conditioning systems;
- Oxygen system - storage capacity, pre-flight checks, system function (passengers and crew);
- Systems Limitations;
- Human Limitations including hypoxia and period of useful consciousness.

Operations at high altitude including:

- Airspace classification;
- Licence and rating privileges;
- Rules of the Air;
- Weather;
- Air Navigation (BR Nav).

Normal operation including pre-flight checks, setting and monitoring during:

- Take-off and climb;
- Cruise;
- Descent;
- Approach and Landing.
- In-flight failures and emergency handling including:
    - Use of oxygen;
    - Emergency descent including terrain and ATC considerations;
    - Single Engine Stabilising Altitude (Multi-Engine only).

4.3.5 **Tail Wheel**

Differences Training completed, for this section, on an SEP aeroplane, does not provide equivalent qualification on MEP aeroplanes:

- Physical differences;
- Loading and Effect of CG Position.
- Dynamic differences and handling during:
- Ground handling;
- Starting and taxying;
- Taking-off;
- Engine failure during take-off;
- Landings including 2-point “Wheelers” and 3-point landings (as applicable to type);
- Crosswind operations;
- Parking and mooring.
- Landing and ground handling with one or more engines inoperative (Multi-Engine only).

4.3.6 **Variants within a Type Rating**

- Weight and loading - normal, utility and aerobatic load categories;
- Take-off and climb performance;
- Cruise performance;
- Landing performance;
- Speeds for normal operation;
- Speeds for emergency operation;

- Airframe limitations;
- Manoeuvre imitations and aerobatics;
- Spinning;
- Stall/Spin warning for protection systems;
- Fuel system;
- Engine systems and instrumentation;
- Undercarriage system;
- Electrical system (DC and AC);
- Cabin and environmental system (including pressurisation);
- Cockpit and cabin oxygen systems;
- Caution and warning annunciator system;
- Flight instrumentation;
- EFIS and navigation systems;
- Autopilot and trim system including pre-flight checks;
- Other systems including pneumatic, vacuum and hydraulic;
- Aerodynamic controls and handling characteristics;
- Engine handling;
- Flaps and lift/drag augmentation;
- Other systems particular to type;
- Emergency procedures.

4.3.7 **Single Lever Power Control (SLPC) Aeroplanes**

Differences training, for this section, on a single-engine aeroplane does not provide equivalent qualification on multi-engine aeroplanes.

Engine and Ancillaries:

- Fuel type;
- Principles, construction and function;
- Gearbox;
- Turbo/super chargers;
- FADEC / Engine Control Unit (ECU);
- Lubrication, oil type, checking and topping up;
- Cooling - coolant type, checking and topping up.

Propeller:

- Propeller principles;
- Constant Speed Unit (CSU) and governor;
- Care of prop. and ground handling.

System monitoring and control:

- Power control lever, FADEC and ECU integration;
- Standby/manual over-ride power control (if applicable);
- Engine information displays;
- Auxiliary system displays;
- Annunciator panels, caution and warning systems;

Electrical System:

- Electrical system layout, voltage and limitations;

- Alternator system;
- Battery capacity;
- Circuit breakers;
- Distribution, bus bars and switching;
- Use of ground power units;
- Fuel System;
- Fuel quantity distribution and selections;
- Fuel consumption;
- Fuel Labelling;
- Re-fuelling supervision.

Loading and Performance:

- Engine Mass and aircraft loading differences;
- Take off and Climb Performance;
- Cruise performance;
- Fuel consumption and endurance;
- Landing performance.

Handling:

- Starting and shutting down;
- Engine master switch;
- Pre-flight checks and ECU testing;
- Normal operations;
- Fire and Emergency handling;
- Use of main power control lever;
- Use of standby / manual over-ride power controls (if applicable);
- Power settings and speeds for normal and emergency operations;
- Take-off / landing configuration differences.

and review of Pilots' Operating Handbook.

Converting from SLPC Aeroplanes

Engine and System Components, Construction, Layout and Function:

- Power control indications;
- Fuel system;
- Ignition system - where applicable;
- Carburettor heat/alternate air control - where applicable:
    - Theory of carburettor icing.
- Mixture control:
    - Theory and need for manual mixture control.
- Ignition system:
    - Theory of magneto ignition - where applicable.
- Fixed pitch propeller theory;
- Engine cooling.

Operation and Engine Handling:

- Performance and loading considerations;

- Range and endurance;
- Pre-flight inspection;
- Starting taxying;
- Power and function checks;
- Take-off and climb;
- Cruise, including fuel system handling and fuel consumption;
- Use of carburettor heat control;
- Mixture leaning using mixture control;
- Engine handling during descent, approach and landing;
- Shutdown.

Limitations:

- System limitations for despatch
- Operating limitations during flight
- Considerations for shutdown.

In-Flight Failures and Emergency Handling:

- Engine failures including memory and checklist items;
- Engine overspeed in descent;
- Engine fire on the ground / in the air;
- Other emergency checklist procedures.

4.3.8 **Electronic Flight Instruments System (EFIS)**

Airborne training in the use of Integrated EFIS demands considerable attention of both instructor and pilot, often at the expense of lookout and flight safety. It is recommended, therefore, that this training be carried out with an appropriate Part Task Trainer, FNPT or other STD. In any event, maximum use should be made of any available videos, manufacturers or agents' computer-based training aids and programmes.

System overview:

- System components and sub-systems;
- Sub-systems arrangement and inputs - including but not limited to:
    - Pitot/Static and Air Data Computer (ADC);
    - Compass and magnetometer;
    - Attitude and Heading Reference System (AHRS);
    - Avionics computer(s).
- Power supply;
- Sub-system principles, construction and limitations System Function;
- Instruments;
- Main and alternative power supplies;
- System electrical demands;
- Communication radios and audio panel;
- Transponder;
- VHF navigation Radios;
- GPS and RNAV functionality and approval status;
- ADF and DME installations;
- Autopilot and flight director;
- Traffic information systems;
- Terrain data systems;

- Weather radar and data-link systems.

Normal Operations:

- Switching on, system initialisation and alignment;
- Test modes and function;
- Cautions and warnings system and display;
- Display brightness and control;
- Display modes, layout and available information;
- Flight instruments display;
- Engine Instruments;
- Use of communications radios;
- Use of transponder system, altitude encoding and traffic information system, aircraft identification (Mode S) and mode of use;
- Use of VHF navigation systems;
- Use of ADF and DME;
- Use of GPS and RNAV functions;
- Navigation displays;
- Instrument approach operations (for RNAV instrument approach operations see CAP773);
- Autopilot and Flight Director selection and control functions.

Abnormal Operations:

- Sub system / system input malfunction
- Screen failure
- Composite, backup or reversionary display function
- Radio failure and emergency operation
- Electrical failures, fire and shut-down
- Flight by reference to standby instruments
- Aircraft system cautions and warnings
- EFIS message advisories.

4.3.9 **Differences training in Single Pilot aeroplanes with Electronic Flight Instrumentations Systems (EFIS)**

Increasingly, single-pilot aircraft are being fitted with digital Electronic Flight Instrumentation Systems (EFIS) consisting of electronic ‘glass instruments’ and integrated digital avionics displays of widely varying complexity and capability. These systems present a significant change from conventional, mechanical flight instruments in the way the information is presented and the interpretation of these systems requires a thorough understanding by the pilot.

For the purposes of this requirement, an EFIS display requiring differences training is an electronic presentation of the primary flight instruments that presents gyroscopic instrument, pressure instrument and navigation information that is used by the pilot as a primary reference for control of the aircraft in flight.

Differences training requires both theoretical knowledge and training on an appropriate training device or an aeroplane. The instructors and training providers who may give the training are detailed in subsequent paragraphs.

Pilots converting to an EFIS equipped aeroplane for the first time, within the Single Engine Piston Class Rating, are required to complete differences training to the satisfaction of an appropriately qualified Class or Instrument Rating Instructor or Flight Instructor. Those pilots with logbook evidence to show that they have been operating these aircraft as pilot in command, prior to September 9th 2010, the issue date of an AIC on the topic, are exempt from this requirement.

Pilots converting to another EFIS equipped aeroplane within the privileges of other type or class ratings are strongly advised to complete similar differences training. When converting either to or from EFIS within a single-pilot type rating, pilots should attend a Training Organisation approved to conduct type-rating training courses on the particular aircraft type and variant.

4.3.10 **Converting between different EFIS installations**

Pilots converting to another Integrated EFIS display should obtain further differences training, whether or not the same manufacturer produces the new system. Familiarisation training should be sufficient for FIs or CRI/TRIs who are fully qualified to teach all applied instrument flying and who are already trained on another Integrated EFIS system.

4.3.11 **Converting from EFIS to Mechanical Instruments**

Pilots trained in using Integrated EFIS displays but not trained on mechanical flight instruments, are likely to have established a scan pattern quite different from the techniques required by a conventional, mechanical instrument layout. These pilots are strongly advised to obtain differences training on conventional instruments, including selective radial scan techniques, before flying an aircraft with conventional mechanical instrumentation. EFIS can provide very precise information, which requires little interpretation, as opposed to conventional instrument displays, which require considerable interpretation and different scan techniques. A key element in this type of training, on whatever system, is ensuring the pilot fully understands what information is available, what is being displayed and how to interpret the display correctly.