BAAI

BUREAU OF AIR ACCIDENT INVESTIGATION

AIRCRAFT ACCIDENT REPORT (Ref. N0 3/2017)

Report on the Gear-up Landing Accident
(14th September 2017)

This investigation has been conducted in accordance with *Annex 13 to the ICAO Convention on International Civil Aviation*, *EU Regulation No 996/2010* and *The Civil Aviation (Investigation of Air Accidents and Incidents) Regulation; Legal Notice 16 of 2013*.

Under these Regulations, the sole objective of the investigation of an accident or incident is the prevention of accidents and incidents in the future. It is not the purpose of this investigation to assign fault or blame and the reporting process should not be used to determine liability.

BUREAU OF AIR ACCIDENT INVESTIGATION

ACCIDENT REPORT

Aircraft Type and Registration:	Piper PA-34-200T Seneca II, 9H-AEB
No & Type of Engines:	2 Continental Motors Corp TSIO-360-RB piston engines
Year of Manufacture:	1978 (Serial no:)
Date & Time (UTC):	14th September 201: 18.07
Location:	Luqa Airport Malta RWY23/05
Type of Flight:	Training Flight
Persons on Board:	Crew - 2
Injuries:	Crew - None
Nature of Damage:	Damage to both propellers and superficial damage to underside of the fuselage and engine cowlings
Commander's License:	Instructor License.
Commander's Flying Experience:	**5,300 hours**. Multi-Engine time; 934hours of which 60 were on the Seneca II
Training Pilot Flying Experience	220 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and further investigations by BAAI.

***1.0** Synopsis*

The crew was on a training flight performing circuit work, including touch-and-go and single-engine approaches and landings. Flying from the left seat was the student pilot who had previously logged approximately 4 hours Multi-Engine time on a different type of aircraft with a different flight school.

On this approach the crew landed with the landing gear in the up position. A combination of factors may have contributed to this accident, including the fact that both pilots were relatively inexperienced in this type of aircraft.

2.0 History of the flight

The aircraft landed on RWY 23/05 with the landing-gear in the up position. The two pilots evacuated the aircraft using the normal entry/exit door. Emergency services attended, but there was no fire or need for assistance.

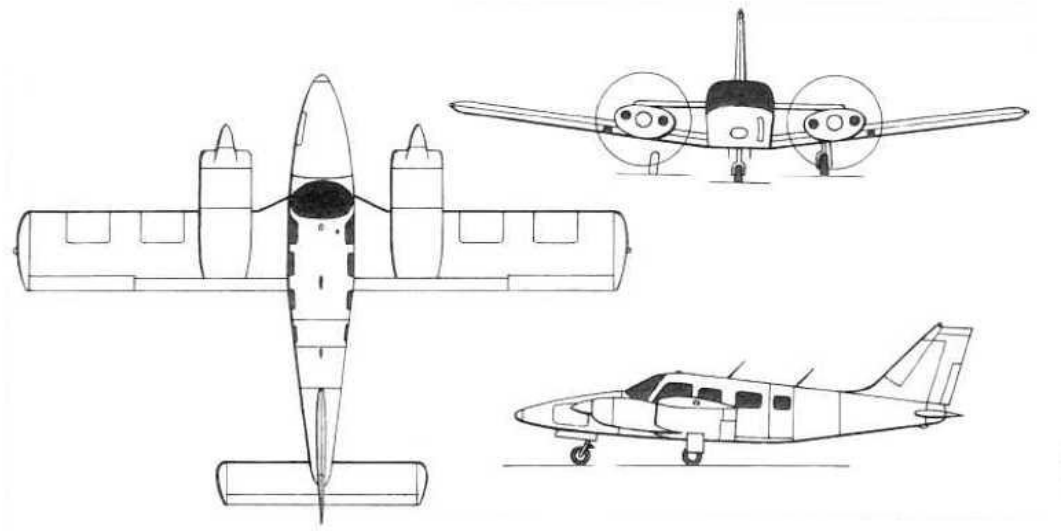


Fig. 1

3.0 Technical information;

Main Landing Gear extension/retraction system

3,01 The Seneca II uses hydraulic power supplied by a single reversible electric pump/ reservoir to raise and lower the landing gear. Normal gear selections are made using a switch on the instrument panel labelled "**up"** and "**down"**.

3.02 If hydraulic pressure is lost, all three gears should drop under their own weight. The landing gears are designed to free-fall if the emergency extension valve is pulled.

3.03 The main gear down-lock mechanism comprises a conventional over-center side-stay, kept in lock by a pair of hooks engaging on a pin.

3.04 Engagement of the hooks also actuates a micro-switch to illuminate the associated *down-and*

locked green light in the cockpit. Under normal operations (*powered extension*), the final movement of the actuator engages the hooks, but in a free-fall extension, a spring is used to engage the down-lock hooks. If any one of the three gears fail to down-lock, a gear-unsafe red warning light illuminates.

4.0 *Landing-Gear Indications and Aural Warnings.*

4.01 When the LANDING-GEAR is fully down, *three green lights* indicate that the LANDING GEAR is down and locked, and a convex mirror on the left engine nacelle enables the pilot to confirm the position of the gear. If the **"**NAV Lights**"** are switched on, the gear lights are automatically dimmed. A **"**RED WARNING**"** light illuminates on the instrument panel if the landing gear is not fully locked in the selected position.

4.02 A micro switch incorporated in the throttle quadrant activates a warning horn under the following conditions:

- Gear up and manifold pressure reduced below 14 inches on either one or both engines.
- Gear selector switch in the UP position when the aircraft is on the ground.

5.0 *Inspection of the Aircraft and Official Documents***.**

- Following the accident, the aircraft was taken to a hanger and placed on hydraulic jacks. Here the aircraft was raised sufficiently off the ground to allow the necessary test and maintenance to be carried out safely. As part of the investigation, the Aircraft systems and operation of the Landing-Gear were carried out and found to be fully functional. The aircraft electro-hydraulic pump as well as the free-fall emergency extension operated normally.

- Aural and visual warning systems were tested and found to operate according to the official Piper Seneca technical manual.

    1. The 3 green lights on the instrument panel came on when the landing gear was extended down and locked.

    2. The aural warning was tested and found to operate according to the Piper Seneca Technical Manual.

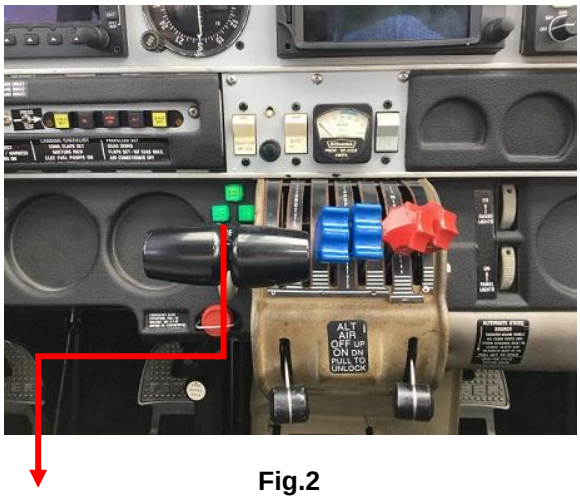


Fig.2
3 Greens on the Landing-Gear down and locked indication.

5.1 *Visible damage.*

- Both propellers suffered extensive damage.
- Both engines and associated systems must be thoroughly checked for damage sustained during the accident.
- Scratch marks on various parts of the underside of the fuselage.

Fig.3

Damaged Port and Starboard Propellers

5.2 *Maintenance Records and Legal documents.*

Maintenance records were checked and found to be correct. Maintenance carried out according to schedule and recommended standards as stipulated by law and Piper Seneca II standards. Legal documents found to be compliant with the Maltese Law.

***6.0 Checklist Format*.**

6.01 *Basically, there are two checklist formats*.

- *The flow-checks method (Do and read).* This requires that the checklist items are first accomplished from memory and then the checklist is reviewed to ensure that all items contained in the checklist have been completed. The items are read from the checklist and physically or visually confirmed.

- *The self-challenge/response method (Read and do).* This requires that all items on the checklist to be sequentially completed and then checked for correct position of associated switches and system operation. The checklist should be read aloud.

6.02 Conventional thinking is that the SELF-CHALLENGE/RESPONSE format should be used for all checklist groups ***prior*** to RWY and T/O procedures, while the FLOW-CHECK format should be applied to RWY and T/O checklist groups as well as airborne groups including the pre-landing checklist.

***7.00 Interview with the crew*.**

The crew was interviewed on the 26th of October at the BAAI office Valletta.

The importance of human factors in aviation, particularly pilot error, has long been known, but few people seem to understand how important it is to be mentally and physically prepared (*well rested*) for a flight. This is highlighted by the fact that about 80% of aviation crashes and 50% of aviation

incidents are attributed to pilot error. Statistically, the improper use, or the non-use, of the normal/abnormal checklist by flight crews is one of the most common pilot errors.

7.01**.** *Pre-flight preparation*. The instructor gave a detailed description of how the training session was organized. He said that; weather at the airport, NOTAMs, weight and balance, performance calculations and the exercises to be accomplished during the flight, were reviewed.

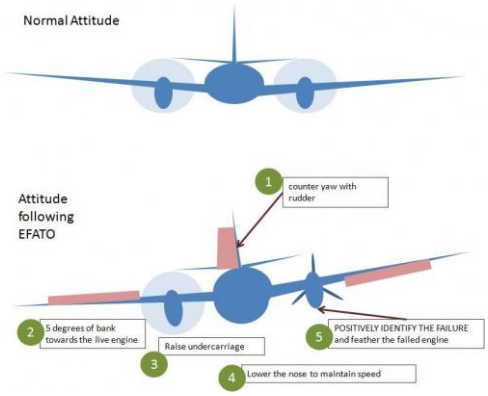
7.02 The student pilot had already logged approximately 4 hours Multi-time on another type of aircraft consequently he was only scheduled to fly just 2 hours on the Seneca. According to regulations, six hours of multi time are enough to qualify for the multi engine rating.

7.03 The instructor said that he was not satisfied with the fact that the student pilot was only required to fly the Seneca for just two hours. In his opinion, more time (more than 2 hours) on type is necessary for a pilot to become proficient on a new type of aircraft, especially if the pilot is an inexperienced student pilot.

7.04 The instructor remarked that the fact that he was required to achieve what normally takes more than 2 hours to accomplish, has distracted him from his primary duties; .

7.10 To qualify for the Multi-Engine Rating, a pilot must demonstrate that he can safely fly a "*single engine approach and landing"*. A pilot should thoroughly understand the aerodynamic problems which surround asymmetric flight and perform, without hesitation and in a deliberate manner, the actions that must be accomplished in the event of an engine failure. (Ref fig 4 & 5)

Fig 4



Note. Although an engine failure is not considered to be a catastrophic failure in a multi engine aircraft, it can be very demanding on the crew – something which significantly contributed to this accident. As can be seen from the flow chart below, situational awareness is essential to gain control of the aircraft.

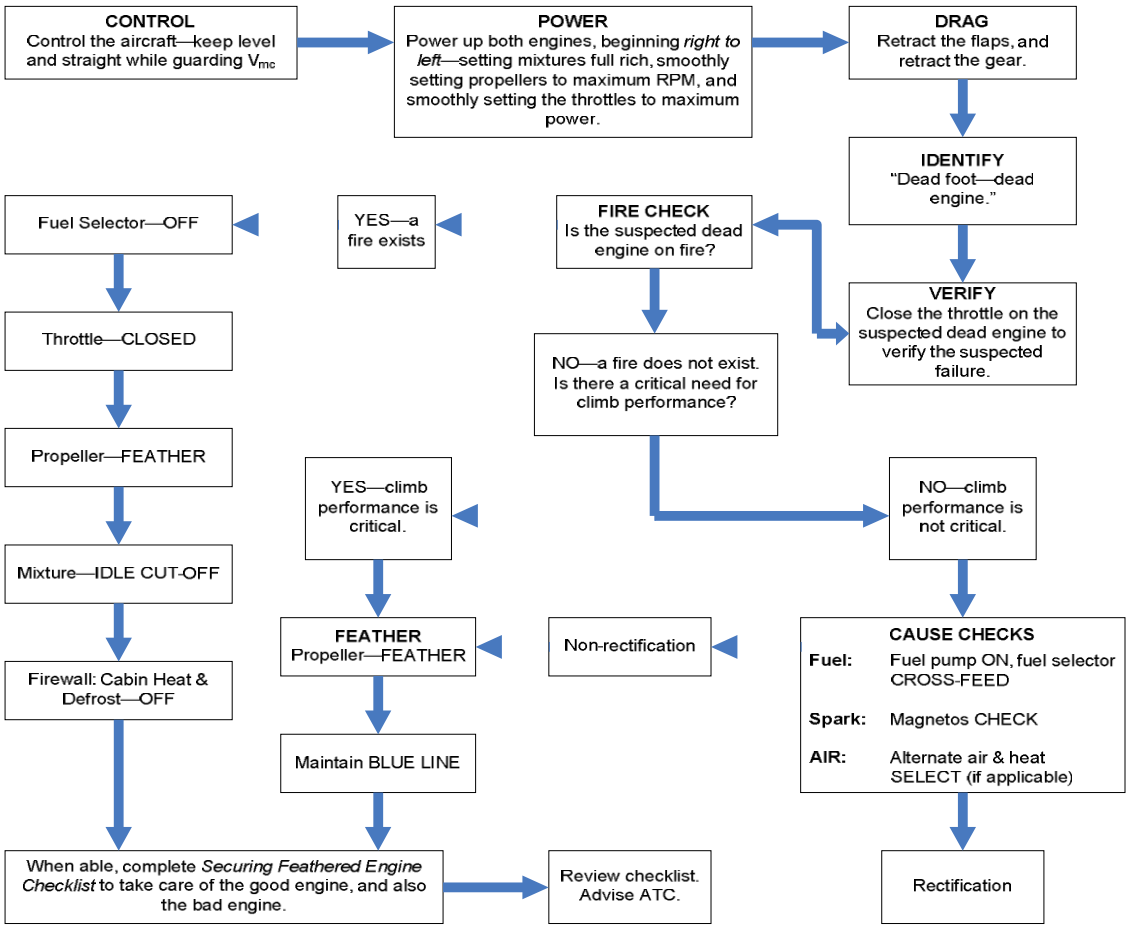


Fig.5
A typical engine failure flow chart.

8.00 Standardization and cockpit safety

The basis of pilot standardization and cockpit safety is the checklist which is purposely produced by aircraft manufacturers to guard against human error. Performing checklist actions by recall only, without consulting the aircraft's checklist is never advisable as it will lay to waste a valuable cockpit resource.

The crew's failure to complete the before-landing checklist or to complete the checklist according to the correct procedure (ref item 6.01) may have contributed to this accident. The question is; what distracted the crew and did the crew cut corners by not sticking to procedures

8.02 When interviewed by BAAI, neither pilot was able to explain what actually happened during the latter stages of the approach onto RWY 23/05, nor why it had happened. ATC was never informed that they had a problem which means that the crew was completely unaware that the undercarriage was still in the up position.

The landing gear is mentioned in the following Checklists;

- Pre-Landing Checklist
- Single Engine land

- Final Vital Items.

. Reference: Appendix "A" of this report

8.03 *During the interview, the following points were noted*:

1. The student pilot was relying on his instructor's advice to fly the aircraft according to the Seneca recommended procedures. *Note: This was the student-pilot's first flight on the Seneca II.*

2. The instructor has approximately 5300 flying hours and has flown as an instructor for a foreign airforce on jet as well as propeller aircraft. His total flying time on the Seneca II was approximately 60 hours..

3. The crew did a proper briefing, but because of delays on the ground and lost time in the air, they found themselves struggling to finish the whole session in just two hours.

4. There was some confusion on the flight deck as to who was expected to do what.

5. Due to Goal fixation, the crew was unsure if the *approach checks* were inadvertently omitted, done by recall or how and who performed the checks.

6. In the briefing room, the instructor did an in-depth takeoff, cruise and approach/go-around briefings and also a detailed discussion about the exercises to be completed during the flight.

9.0 Conclusion.

When the aircraft was checked in the hanger, BAAI found no evidence of "pre-impact mechanical malfunctions or anomalies" that would have hindered the plane's normal operation. This means that there were no mechanical malfunctions that could have contributed to the accident. CCTV footage shows the student pilot performing a near perfect landing, which explains why the aircraft suffered only minimal damage and confirms that the aircraft was completely under control throughout the approach and landing.

During the interview, the crew said that felt that they were under pressure to perform all the required exercises in just 2 hours. This may have created a situation where time management became more important than flight management and safety. A simulated engine failure is by no means an easy exercise therefore enough time should be devoted to perform all actions correctly, including consulting the official checklist after gaining full control of the aircraft and when time permits.

The final conclusion is that the crew may have fallen victim to one or more of what is referred to in aviation as the "FATAL FIVE". (*Reference Flight Safety article by* Kreisha Ballantyne*)"* . It is highly probable that items (1) Task Saturation and (2) Task/ Goal Fixation, which causes all cognitive capacities to be focused on one task exclusively, may have reduced the crew's capacity to accomplish what they normally perform efficiently and safely.

The Fatal Five.

1. Task Saturation.

2. Task/Goal Fixation. (Fixation causes all cognitive capacity to be focused on one task.)

3. Attribution Error.

4. Vigilance Decrement.

5. Confirmation Bias.

It is good airmanship to remember that paying attention to detail and performing all actions according to the recommended procedure without cutting corners, may mean the difference between a flight that ends successfully and one that ends in tragedy.

10.0 Recommendations

1. Use the official checklist and follow it accurately - it is a reliable cockpit resource.

2. Develop the objective to comply with safe operating practices and act upon it especially when under pressure.

3. Do not substitute safe practices with your own shortcuts.

4. Know when your resolve to conform may weaken as this may be the first indication that the aircraft is ahead of you.

5. Plan into your mind-set how you will overcome that weakness and stick to it.

Capt. Frank Zammit.

Chief Investigator of Air Accidents.

Appendix A

Seneca II Normal and Abnormal/Emergency Check-List.

PREFLIGHT CHECK

COCKPIT PREPARATION

Aircraft Documents---------- Stowed
Parking Brake---------- ON
First Aid Kit---------- Stowed
Fire Extinguisher---------- Check
Gear Selector---------- Down
Gear Emergency Selector----------In & Guarded
Battery Master Switch---------- On
Landing Gear Lights----------Three Greens
Fuel Quantity----------Adequate + Reserve
Battery Master Switch---------- OFF
Magneto Switches---------- OFF
Mixture---------- Iddle cut-off
Trim Indicators---------- Neutral
Flaps---------- Check Operation
Flying Controls-----Full Free Correct Movement
Empty Seats---------- Fasten Belts
Cross Feed Drains---------- Operate

OUTSIDE CABIN

Battery Master Switch---------- ON
Exterior Lights---------- On / Check/Off
Stall Warning Vanes---------- Check
Pitot Heat -------Check (Max 3 min ground ops)
Battery Master Switch---------- OFF
Windshield ---------- Clean
Bagage and rear door -----Secure and Locked

BEFORE STARTING ENGINE

External Checks---------- Completed
Main Doors---------- ---Closed & Latched
Seats/Belts/Harnesses----------Adjusted and Set
Parking Brakes---------- SET
Alternate Air Controls---------- OFF
Circuit Breakers---------- IN
Cowl Flaps---------- Open
Battery Master Switch---------- ON
Avionics Master & Radio---------- ON
ATIS Copied and Start-up Clearance--Obtained
Altimeter---------- Set with local QNH
Radio & Avionics Master---------- OFF
Battery Master Switch---------If no clearance OFF

STARTING ENGINES

Battery Master Switch---------- confirm ON
Beacon light (Fin light)---------- ON
Auxiliary Fuel Pumps---------- OFF
Avionics Master---------- OFF

Starting Engine Nº 1

Fuel Selector Nº 1---------- On
Mixture Nº 1---------- Full Rich
Propeller Nº 1---------- Full Forward
Throttle Nº 1---------- Half Travel
Magnetos Switches Nº 1---------- On
Prime----------(3 Secs Warm, 6 Secs Cold)
Propeller Area---------- Clear
Starter---------- Engage

When Engine Starts

Throttle----------Retard and Set 1000 / 1200 RPM
Oil Pressure Nº 1---Check (Rise Within 30 Secs)
Alternator Nº 1----ON and Check (Max 60 Amps)
Gyro Pressure----Check / Warning Indicator OFF
Alternator Nº 1---------- OFF

Starting Eng Nº 2--- Repeat procedure for Nº 2

Alternators----Both ON check balance approx 15 AMP each

AFTER START CHECK LIST

PFD---------- ON
Electrical Trim----------ON/Check/Set
MFD---------- Check units
Avionics Master Switch---------- On
Intercom---------- Check On & Volume Set
Comms/Navs 1&2 / DME / ADF ---------- On
Transponder ---------- Standby

Left Fuel Selector --- Check Shutoff / X-Feed / ON
Right Fuel Selector - Check Shutoff / X-Feed / ON

Avionics ----------CHECK & SET for departure
Markers---------- On
A/P---------- ON / Check / Disconnect (red button)
Cabin Heat/Defrost---------- Check
Air Intake---------- Open
Heat/Fan Switch ---------- Check
Defrost Switch---------- ----------Check
Fan---------- As required
Clock ---------- Set (UTC)
Stop Watch---------- Wound
Nav Lights---------- As req.
Fuel Pumps---------- ON & OFF Check
Flight Instruments---------- Set and Check
Radios---------- Intentions & request taxi

TAXI CHECKLIST

Look outside and Check-------(Right & Left Clear)
Parking Brake---------- OFF
Brakes & Steering (Both Pilots)---------- Check
Flight Instr. (TC, HIS, Compass, AH, RMI) Check

POWER CHECKS

Position---------- Into Wind & Area Clear
Parking Brake---------- On
Temperatures & Pressures---------- Check
Cowl Flaps---------- As Required
Fuel Selectors---------- ON
Throttle---------- 1200 RMP

Commence With Left Engine Checks

Propeller Feather----------Check Max. 300 RPM
Throttle---------- 1900 RPM
Propeller Control---------- Exercise
Propeller---------- Check Governor
Alternate Air---------- On Then Off
Magnetos---------- Check 150/50
Alternators Output---------- ----------Check
Gyro pressure---------- 4.8 – 5.1"Hg
Throttle--------Close/Check Idle (700 –900 RPM)
Throttle---------- 1000 RPM
Pressures & Temperatures---------- Check
Fuel Flow----------Check (Usually 5 –7 GPH)
De-Icing Boots---------- Check
(Inflate (6 secs) Suction Drops 6")
Propeller De-Icing-------- -Check Twice On & Off
Annunciator Panel---------- Test

BEFORE TAKE OFF CHECK

Trimmers---------- Set / (T.O. pos.)
Throttle Friction---------- Set
Mixtures---------- Rich
Fuel Selectors---------- On Check Content
Propellers----------Fully forward(Max RPM)
Auxiliary Fuel Pumps---------- Off
Flaps---------- (As required) Set for T.O.
Cowl Flaps---------- Set (1/2 or fully open)
Alternate Air---------- Off
Cabin Heater/Defrost----------As Requested
Seat Belts/Seat Back----------Secure/Erect
Main Doors---------- Latched & Closed
Flying Controls----------Full/Free Movement
Auto Pilot---------- Confirm Off
Departure Clearance---------- Copied
TO and Departure briefing ----------Completed
Altimeters---------QNH set / Check vs elevation
Avionics----------Confirm RAD/NAV
Engine Instruments---------- Check
Propeller De-Icing---------- As Required
Vent Fan---------- Off
Take Off ---------- Clearance

RWY ITEMS

T.O. Time ---------- Noted
Flaps---------- Check
Transponder---------- Set ALT Mode
Landing, Recognition, Anti-Collision Lights---On
Pitot Heat--------As Required (Max 3 Min on gnd)
RWY HDG---------- Check when aligned

AFTER T.O. CHECK LIST

Gear--------Up (Max Retraction Speed 107KTS)
Flaps---------- Retract Above 200' AGL
Power---------- Set 32"/2450 RPM
Landing lights---------- ----------OFF
Altimeters---------- Set / Cross Checked
Icing---------- Check
Radio Aids---------- Identify If Required

CRUISE CLIMB CHECK LIST

Climb PWR---------- Set 32" / 2450 RPM
Pitch down ----------(Speed 100 / 110 KIAS)
Cowl Flaps---------- As Required
ATC Liaison to proceed as VFR / IFR

CRUISE CHECKS

Cruise Power---------- Set as Required
Mixtures---------- Lean ROP
EGT---------- check max 1550^0 F
Engine Instruments---------- Check
Cowl Flaps---------- As Required
Icing---------- ---------- Check OAT
FREDA CHECKLIST

DESCENT CHECKS

ATIS---------- ---------- Read
Altimeter---------- - Set with local QNH
EDM---------- Check cooling rate
MSA---------- ---------- --Checked
Fuel---------- Check Sufficient
Mixtures---------- Enrich with Descent
PWR Setting ---------- Reduce as Required
Cowl Flaps---------- Closed
Engine & Associated Instruments---------Check
Icing---------- Check

APPROACH CHECKLIST

Radio/Nav Equipment----------Set / Identified
H.S.I./R.M.I & Compass----------Cross Checked
Altimeters---------- Set/Cross Checked
Approach Briefing ---------- Completed
Minimums---------- Set MFD

PRE LANDING CHECKLIST

Seats/Seat Belts---------- Erect/Secure
Fuel Selectors ---------- ---------- ON
Rudder---------- Neutral
Flaps---------- -Set
Cowl Flaps---------- Open
Mixtures---------- Rich
Propellers---------- 2450 RPM
Brakes---------- Off
Landing Gear----------Down / below 129 KIAS
(three green one on the Mirror)
A/P ---------- --OFF
Landing Lights ---------- --ON

FINAL VITAL ITEMS

Mixtures ("Reds")---------- Full Rich
Propellers ("Blues")---------- Full Forward
Undercarriage----------3 Greens

AFTER LDG CHECKLIST

Landing Time---------- Noted
Flaps---------- Up
Transponder---------- STBY
Pitot Heat---------- Off
Recognition Lights---------- Off
Landing Lights---------- As Required
Propeller De-Ice---------- Off
Air Intake---------- -------Open
Heater/Fan Switch---------- Fan
Defroster---------- As Required

Trimmers---------- Neutral
Cowl Flaps---------- ---------- Open
Radio / Nav Equipment---------- As Required

SHUTDOWN CHECKIST

Parking Brake---------- ON
Throttles---------- 1200 RPM
Avionics & Avionics Master Switch---------- OFF
Heater / Fan---------- 2 min then OFF
Ammeters----------Check (Less Than 10 AMPS)
Exterior Lights - except ACL (Fin) Light---------OFF
Check --------3 Mins Have Elapsed Since Landing
Mixtures---------- ----------I.C.O
Magnetos---------- OFF
Anti Collission Light (Fin)---------- OFF
Interior Lights---------- All OFF
Battery & Alternators---------- -----OFF
Control Wheels----------Secure With Seat Strap

DURING CLIMB IN HOT WEATHER CONDITIONS, IT MAY BE NECESSARY TO USE LO AUXILIARY FUEL PUMP FOR VAPOR SUPPRESSION

AVOID CONTINUOUS GROUND OPERATION BETWEEN 1700 – 2100 RPM IN CROSS / TAIL WIND OVER 10 KT

AVOID CONTINUOUS OPERATIONS BETWEEN 2000 RPM and 2200 RPM ABOVE 32" MP

*** PFD default units:**
- **Alt/Vs - feet**
- **Spd - kts**
- **Navangle – magnetic**
- **Distance - Nm**

V-speeds for SENECA II

Vso .....61 KTS
Vs1 .....63 KTS
Vmca .....66 KTS Vr
(Short Field).....71 KTS Vr
(Normal).....80 KTS Vx
.....76 KTS Vy
.....89 KTS
Vyse.....89 KTS
Vsse.....76 KTS
Cruise Climb.....32' / 2450rpm ... 110 KTS

Holding speed.....1 20 KTS
Downwind 10º Flap & Gear down 100 KTS
Base 25º Flap.....95 KTS
Final 40º Flap.....85 KTS
Intermediate Apch Segment .....120-100 KTS
Final Apch Segment 25º Flap.....95 KTS

Vne .....195 KTS
Vno.....163 KTS
Va .....135 at 4407 lbs / 121 KTS at 3068 lbs
Vfe 10º.....138 KTS
Vfe 25º.....121 KTS
Vfe 40º.....107 KTS
Vle.....129 KTS
Vlo Extending.....129 KTS
Vlo Retracting.....107 KTS
Demonstrated X-WIND ..... 17 KTS

STARTING ENGINE WHEN FLOODED

Mixture---------- --Iddle Cut Off

Throttle---------- FULLY FORWARD
PROPELLER---------- FORWARD
Master Switch---------- ON
Magnetos---------- ON
Auxiliary Fuel Pump---------- OFF
Propeller Area ---------- Clear
Starter ---------- Engage
When Engine start:
Throttle---------- retard
Mixture ---------- Advance slowly

STARTING ENGINE IN COLD WEATHER

Props----------Turn through by hand (3 times)
Fuel Selector---------- ON
Mixture---------- Full RICH
Throttle---------- full FORWARD
Propeller Control---------- full FORWARD
Master Switch---------- ON
Magnetos---------- ON
Auxiliary Fuel Pump---------- On low boost
Starter---------- Engage
Primer---------- On for 3 seconds
Throttle---------- full FORWARD to full AFT
Primer---------- ON & OFF every 3 sec.

STARTING ENGINE WITH EXTERNAL POWER SOURCE

Master Switch---------- OFF
All electrical equipment---------- -----OFF
Terminals---------- Connect
External Power plug----------Insert in Fuselage

Proceed with normal start:
Throttles---------- lowest possible RPM
External power plug-----disconnect from fuselage
Master Switch ---------- ON (Check ammeter)
Oil Pressure---------- Check

ENGINE FIRE ON GROUND

If Engine has Not Started:
Mixture---------- I.C.O
Throttle---------- Open Fully
Starter---------- Operate
If Engine Has Started:
Engine---------- Keep Running
If Fire Continues, After A Few Seconds
Throttles---------- Closed
Mixtures---------- I.C.O.
Fuel Pumps---------- Off
Fuel Selectors---------- Off
Magnetos---------- --------Off
Brakes---------- Set
Battery Master Switch---------- Off

ENGINE FIRE IN FLIGHT

Affected Engine:
Fuel Selector---------- Off
Throttle---------- Close
Propeller---------- Feather
Mixture---------- I.C.O.
Heater---------- Off
Defroster---------- Off
If fire continues and terrain permits----------
---------- Land Immediately
Note : DO NOT Attempt A Restart Following An Engine Fire

ENGINE FAILURE MEMORY ITEMS

AUTOPILOT .....D ISCONNECT
FLY THE AEROPLANE.....PITCH FOR BLUE LINE
.....PUSH RUDDER TO MAINTAIN HEADING
.....(and some aileron to same side)
POWER-UP.....MIXTURES FULL RICH
.....P ROPELLERS FULL FORWARD
.....TH ROTTLES ADVANCE, Max 40"
CLEAN-UP (minimise drag).....LDG GEAR UP
.....FLA PS RETRACT
IDENTIFY.....DEAD FOOT is DEAD ENGINE
VERIFY---------- THROTTLE DEAD ENGINE CLOSE
FEATHER (restart not feasible or when failed)
.....PROPELLER DEAD ENGINE FULL FEATHER
MIXTURE DEAD ENGINE.....IDLE CUT-OFF

SECURE DEAD ENGINE AFTER FEATHERING

Fuel Selector Dead Engine.....SHUT OFF
Mixture Dead Engine.....(Verify) I.C.O.
Cowl Flap Dead Engine.....CLOSE
Magnetos Dead Engine ..... OFF
Alternator Dead Engine.....OFF
Fuel Pump Dead Engine.....(Verify) OFF
Engine Instruments Live Engine.....CHECK
Cowl Flap Live Engine .....OPEN
Electrical Load ....REDUCE
Power Live Engine .....when feasible 32" / 2450 RPM
Gyro Pressure .....CHECK
Fuel Selector Live Engine .....Consider CROSS-FEED

ENGINE FAILURE DURING FLIGHT

Airspeed----------89KTS Minimum (Blue Line)
Trim----adjust 5^0 bank toward operative engine
Memory items---------- Completed

Before feathering & securing Inop. Engine:
Fuel Flow ---------- Check
(If deficient press.)--Aux.Fuel Pump HI BOOST
(If power is not restored)- Aux. Fuel Pump OFF
Fuel Quantity---------- Check
Alternate Air---------- ON
Mixture, T & Ps and Magnetos ----------Check
Re-start---------- Try

Below 66 Kts
Rudder - apply to maintain heading / against turn
Throttles (both engines)-------retard to stop turn
Pitch down---- to increase speed above 66 Kts
Above 66 Kts (pitch to maintain > 66 Kts)
Operative engine----increase pwr as required
Airspeed----------pitch for Blue Line (89 kts)
Drag ---------- ----minimise (Ldg Gear / Flaps)
If Altitude permits a restart may be attempted
If restart fails or altitude does not permit:
Inop. Eng. Prop----------Feather
Inop. Eng----------Complete Eng. Sec. Proc.
Cowl Flaps (Operative Engine.) ----as required

UNFEATHERING PROCEDURE AND STARTING CHECKLIST

Fuel Selector (inop engine)---------- ON
Throttle----------Set¼" Open
Propeller Control---forward to cruise RPM pos.
Mixture---------- Rich
Auxiliary Fuel Pump (inop engine) ----------OFF
Magneto Switches---------- ON
Starter----------engage until prop. Wingmills
Throtte-------reduce power until engine is warm
Alternator----------ON
If engine does not start------- prime as required

ELECTRICAL FAILURES

Double Alternator Failure

Field Circuit Breakers---------- Check/Reset
Alternator Switches Off (both) then turn ON one at a time while observing ammeter
Alternator showing Least (but NOT ZERO) amps. And turn it switch ON
If power is not restored: Check circuit breakers And reset once if required.
Electrical Load---------- As Required
If Output Not Restored:
Battery Master Switch----------Off For 6 Sec Min
If Failure Persists Battery Only Remains Max. Of 30 Mins. Land ASAP.
Extend Gear By Emergency System.

Single Alternator Failure

Field Circuit Breaker----------Check/Reset
Ammeter/Warning Light---------- Check
Alternator Switch---------- Cycle

If Output Restored:
Electrical Load---------- As Required

EMERGENCY GEAR EXTENSION

Check Before Extending gear manually:
Battery Master Switch----------ON
Circuit Breakers---------- IN
Alternator Output---------- NORMAL
Navigation Lights ---------- OFF (Daytime)
Airspeed---------- Below 85 KTS
Gear Selector---------- GEAR DOWN
Gear Emergency Knob-Release Guard & Pull
Gear Indicator Lights----------Check 3 Greens
Red Unsafe Light Out
Nose Wheel Position Check by the Mirror

EMERGENCY DESCENT

Throttles---------- Closed
Propellers---------- Full Forward
Mixture-------As Required for smooth operation
Landing Gear---------- Extend
Flaps ---------- As required
Cowl Flaps---------- As required

TRIM RUNAWAY

Autopilot ---------- Disconnect
Trim ---------- ---Disconnect
Trim and Autopilot circuit breaker----------OFF
Re-Trim ---------- manually

PROCEDURES IN ICING CONDITIONS

Pitot Heater---------- Confirm On
Windshield Heat---------- On
Propeller De-Icer---------- On
Windshield Defroster---------- On
Select Air Intake ---------- OPEN
Heat / Fan Switch ---------- HEAT
Thermostat Control ---------- Hot
Defrost Switch ---------- ON
De-Icing Boots----------On¼-½" Ice Build

If Required:

Alternate Air Controls---------- ON
Alternate Static Source---------- Select

SINGLE ENGINE LANDING

Approach speed---------- 95 KTS
Mixture ---------- Full Rich
Inop. Engine propeller---------- Feather
Landing Gear---------- Down
Flaps ---------- Max 25^0
RudderTrim---------- Set Neutral

When certain of making field:

Flaps 40^0 ---------- if required

Appendix B

Glossary of Abbreviations.

ATC.....,,.....Air Traffic Control.

CAVOC.....Ceiling and Visibility OK.

CCTV..... Closed-circuit television.

ENEMED.....Aircraft Fuel provider.

ICAO..... International Civil Aviation Organization.

LMML..... ICAO-code for Malta.

MATS..... Malta Air Traffic Services

MIA.....Malta International Airport

METAR.....Aviation Routine Weather Report.

NOSIG.....No Significant Change.

OMAS..... Office of the Manager Airport Security.

PIC.....Pilot in Command.

QNH..... Atmospheric pressure adjusted to sea level

SID..... .....Standard Instrument Departure

SOP.....Standard Operating Procedures.