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Aircraft Basics-

Aircraft are designed to be as light as possible while still able to handle the rigors placed upon them for flying safely in most conditions.

Body- also known as the fuselage, the primary form of building the airframe is to use ribs combined with a skin material. This is to provide strength in certain areas and lightness in others. Therefore, it is important that you know how to move an airframe, where you can place weight, and treat it like a highly tuned precision machine. Don’t step where there is no walk tape, don’t push on spinners, if in doubt get help so you know that you don’t damage and down the airframes. Attached to the fuselage are a wide array of navigational antennas, communication antennas, emergency locators, the engine, the tail (empennage), along with the cockpit, passenger area, and storage areas.

Wings and Empennage- are designed very similarly to the body with ribs and skin material. It has main wing spars that connect the wings to the fuselage this provides a transfer of g-load to the body. The fuel tanks are normally found in the wings along with instrumentation and lights (pitot and sometimes static ports, Stall warning horns, magnetometers, and lighting). Ailerons are control surfaces on the outer edge of the wings that aid in maneuvering the aircraft. Flaps are included in the wing and are secondary controls that change the angle and airspeed of the aircraft for takeoff and landings. The tail sometimes has some navigational antennas in them along with the vertical stabilizer (elevator) and the horizontal stabilizer (rudder).

Moving to the flight deck area, we have the seats for the pilots, controls to move the primary control surfaces - ailerons and elevator are controlled with a stick or a yoke; rudder is controlled by the feet with the rudder pedals. Above the rudder pedals are the toe brakes. They are used for controlling the speed of a taxiing aircraft and the rudder is used for controlling the direction it is being taxied. Also, the instrumentation is found along with controls over the engine and lights.

Static wicks are attached to the airframe to dissipate any static electricity that accumulates on the airframe. Failure to remove the static electricity could result in communication and navigation issues. It also could have negative consequences if there were static build ups in the fuel tanks.

Lightning Discharge is also designed into the airframe. The aircraft is designed to allow lightning to strike and pass through the aircraft without killing the occupants or igniting the fuel.

There is a bonding check that is done to verify that no specific area picks up or retains a static charge. This is why there are bonding straps to all moving parts of the aircraft such as the flaps.

The landing gear is designed to hold a specific maximum weight. This is designed into the airplane. Exceeding that weight could damage the airplane. The gear is comprised of independent brakes, the spring bar, and the tire assembly. The tire should not have any chords or threads showing. If you see those you are at the final layers prior to inner tube in the tire, don’t fly with chords showing. The brakes consist of calipers with brake pads surrounding a rotor disk. The calipers push the pads against the rotor. Brake fluid is pushed from the toe brake assembly into the calipers, when you release the toe brakes the pressure it will allow the rotor to move. When checking the wear on the brake pads you will need to verify that there are visible half circles on the brake pads, if you cannot identify the half circles have it approved by maintenance prior to flying. The nose wheel in USU’s primary fleet is a free caster, allowing it to move from side to side. There are no brakes on the nosewheel.

Propeller- the propeller is designed to propel the airframe forward. It can be made of many different materials including wood, metal, fiberglass or composite of all three. There is a twist built into the propeller. You should not see any cracks, major dents, or delamination on the propeller. Anything noticed by you should be shown to your instructor or maintenance. Be aware that there is a spinner cone in the center of the propeller, it should not be used to push or move the aircraft with. There are two main types of propellers- constant speed (oil adjusts the angle to maintain a constant speed) and fixed pitch (fixed pitch is a solid propeller that has speed controlled by engine RPM).
Electrical systems- There are three areas of the electrical system. Generator, storage, and consumers. The generator is an alternator or generator this produces electricity by use of magnets and rotation. This produces an electrical charge this goes down to bus bars that feed electricity to the consumers (lights, radios, navigation, etc.). The alternator produces enough energy to feed the system and provide a charge to the storage (battery).

Magnetos might be considered as part of the electrical system, but it is a stand-alone electrical system. Its sole purpose is to provide a spark for the cylinders to keep the engine running. It is so important that there are two separate magnetos to keep the engine running. It has the ability to keep the engine running even if the electrical system and battery fail. So long as the engine is turning and there is fuel the plane will continue to fly.

Engine- Two types exist Fuel-injected and Carbureted engines. The fuel injected engine directly injects fuel into each of the cylinders. The carbureted engine uses a carburetor to mix fuel and air and that is pulled into the engine. The four strokes of the engine are intake (air pulled into the cylinder), compression (the cylinder head compresses the fuel air mixture for optimal combustion), combustion (ignition of the fuel air combination- also known as the power stroke the expansion pushes the cylinder head down), exhaust (pushing the contaminated air out of the cylinder). Carbureted engines are more susceptible to carb icing.

DA-40FP Flight Deck

1. Tie Downs Removed & Baggage – STOWED
   WHEN YOU ARRIVE AT THE AIRCRAFT YOU SHOULD OPEN THE REAR DOOR AND STOW ALL OF YOUR NON-NECESSARY ITEMS. WALK AROUND AND REMOVE ANY TIE-DOWNS KEEPING AN EYE OUT FOR ITEMS THAT MAY GET SUCKED IN BY THE PROPELLER. GET THE FUEL STRAINER AND PROCEED TO #2.

2. Tank Drains & Gascolator - CHECK FUEL COLOR/QUALITY
   WE ARE LOOKING AT THE QUALITY IN THIS INSPECTION. THERE ARE THREE DRAINS YOU WILL BE COLLECTING FUEL FROM. WE WILL HAVE YOU COLLECT ABOUT A HALF INCH OF FUEL IN THE STRAINER TO MAKE SURE THERE IS NO DEBRIS OR WATER PRESENT. PUSHING DOWN ON THE FUEL COLLECTION CUP WILL RELEASE THE FUEL INTO THE LOWER CONTAINER. REPEAT FOR RIGHT, LEFT, AND FRONT CENTER (ALSO KNOWN AS A GASCOLATOR) FUEL DRAINS. THE GASCOLATOR IS THE LOWEST POINT OF THE SYSTEM AND THIS IS WHERE WATER OR DEBRIS IS STOPPED PRIOR TO REACHING THE ENGINE. THE FUEL SHOULD HAVE A BLUE TINT TO IT. IF THERE IS NO COLOR- DO NOT FLY.
   IT TAKES 15 MINUTES FOR WATER TO SETTLE AFTER FILLING A TANK. SUMPING SHOULD BE DONE PRIOR TO REFUELING OR AFTER 20-30 MINUTES OF FUELING.

3. Front Canopy – INSPECT AND CLEAN
   MAKE SURE THAT THERE ARE NO BUG SPLATTERS, WATER STREAKS, ETC. THIS COULD INHIBIT YOU FROM SEEING AIRCRAFT WHILE FLYING. PLEASE MAKE SURE THE CANOPY IS CLEAN AND CLEAR PRIOR TO ANY FLIGHT.

4. Aircraft Docs & Inspections – CURRENT
   FIRST CHECK THE BINDER GIVEN TO YOU FROM DISPATCH. YOU WILL LOOK FOR A CURRENT OR FUTURE DATE ON THE ITEMS IN THE BINDER. INCLUDING TRANSPONDER, ANNUAL CHECK, 100-HOUR, AD’S, AND VOR 30-DAY INSPECTIONS, ETC. SOME PLANES WILL BE LIMITED IN FLIGHT DUE TO INSPECTIONS THAT HAVE BEEN PUSHED OFF. SUCH AS DAY VFR ONLY COULD INDICATE THAT A BONDING CHECK NEEDS TO BE ACCOMPLISHED PRIOR TO A NIGHT FLIGHT OR IFR FLIGHT. THERE WILL BE A PMC (PARTIAL MISSION CAPABLE) LIMITATION ON THE CAN AND AIRCRAFT UNTIL THE CHECK IS COMPLETED. IF YOU ARE LOOKING TO DO A NIGHT OR IFR WITH A PMC NOTE, FIND ANOTHER AIRCRAFT.
   IN THE AIRCRAFT YOU SHOULD HAVE THE AIRWORTHINESS CERTIFICATE ON DISPLAY AND THE REGISTRATION BEHIND THE AIRWORTHINESS CERTIFICATE. ADDITIONALLY, CHECK TO ENSURE THAT THE CORRECT AFM IS IN THE PLANE.

5. Flight Control Lock - REMOVE
   DO THIS PRIOR TO PRE-FLIGHT SO THAT YOU CAN GENTLY MOVE THE CONTROL SURFACES WITHOUT DAMAGING THEM.

6. Ignition Switch – OFF
   MAKE SURE THE KEY IS NOT IN THE IGNITION. THIS SAFETY MEASURE WILL ASSURE YOU THAT IF YOU MOVE THE PROPELLER TO CHECK FOR DINGS THE ENGINE CANNOT TURN OVER ON ITS OWN.

7. Electrical Equipment - ALL OFF
   MAKE SURE THAT ALL LIGHTS ARE OFF, INCLUDING THE DOME LIGHT, PANEL LIGHTS, ETC., AND THAT THE FUEL PUMP AND PITOT HEAT, AS WELL AS THE AVIONICS MASTER SWITCH ARE OFF. THIS WILL ASSURE YOU MAXIMUM VOLTAGE WHEN YOU START THE ENGINE. A SLOW LEAK OF ENERGY OVER THE 20 MINUTES IT TAKES TO PRE-FLIGHT AN AIRCRAFT CAN SEVERELY DISCHARGE THE BATTERY, MAKING IT ALMOST IMPOSSIBLE TO START THE ENGINE WHEN YOU GET TO THAT POINT.

8. Emergency Battery - GUARDED
   THESE BATTERIES ARE INTENDED FOR EMERGENCIES ONLY. VERIFY THAT THE SWITCH IS COVERED, AND SAFETY WIRED SHUT.

9. ELT – ARMED/INDICATOR OFF
   WITH THE ELT IN THE ARMED POSITION AND NO LIGHTS SHINING- THE SYSTEM IS READY TO INDICATE A CRASH OR HARD LANDING. IF YOU EXPERIENCE A HARD LANDING AND SEE A LIGHT ILLUMINATE IN THE ELT INDICATOR, PLEASE CONTACT MAINTENANCE PRIOR TO ANY MORE FLIGHTS.

10. Circuit Breakers - Check In
    WE VERIFY THAT BEFORE ANY FLIGHTS, ALL CIRCUIT BREAKERS ARE IN. THIS MEANS THEY ARE AS FAR “IN” AS POSSIBLE. IF YOU SEE A WHITE CUFF AROUND THE BASE OF THE CIRCUIT BREAKER IT IS “POPPED” OUT. USU ONLY ALLOWS ONE RESET. IF IT POPS OUT ON YOU DURING FLIGHT YOU MUST NOTIFY
DISPATCH OR MAINTENANCE SO WE CAN TRACK ANY ISSUES. IF YOU RESET THE CIRCUIT BREAKER ONCE AND IT POPS AGAIN- TERMINATE THE FLIGHT AT THE NEAREST SUITABLE AIRPORT OR AT THE HOME BASE IF LESS THAN 30 MINUTES AWAY.

11. Mixture Control Lever - IDLE CUTOFF
   This stops the flow of fuel to the engine.
12. Throttle – IDLE
   There is an accumulator pump that mechanically adds fuel to the cylinders when advanced. The idle position again keeps fuel out of the cylinders for the walk around portion of the check list.
13. Carburetor Heat – OFF
   The carburetor heat pulls warm unfiltered air from an exhaust shroud into the engine. This is needed at certain times during flight. See carb heat SOP. For this checklist we verify that it is closed, meaning in the COLD position.
14. Master Switch – ON (no more than 2 mins)
   From the moment the master goes on we want to do this inspection as quickly and efficiently as possible. The flow set up below is to minimize time with the battery on while completing the necessary checks.
   a. Flaps - CHECK OPERATION
   Check movement to the approach and landing positions. Verify flap position lights working properly.
   b. Flight Controls - CHECK FULL DEFLECTION
   Check full deflection left and right- if the flap assembly is re-installed incorrectly you will not have full control in flight.
   c. Flaps – UP
   The flight control check is supposed to be done with the flaps in landing position.
   d. Pitot Heat & Lights - CHECK OPERATION
   Turn on the pitot heat, position, strobe, landing and taxi lights. Walk around the aircraft verify that the lights are on/flashing as appropriate. This part of the walk-around is to verify all the lights work, the pitot heat warms up, and the strobes are flashing. There is a huge draw on the battery for this check so do it as efficiently as possible.
   e. Lights & Pitot Heat – OFF
   Notify maintenance of any burned-out bulbs.
   f. G1000 Databases – CURRENT
   This information is contained on the startup page on the MFD under the name “Aviation Database”. There may be other databases, such as “Obstacle”, which are not kept current. We verify aviation database is current if we are going to use G1000 for navigation in flight. If it is not current contact dispatch.
   g. Fuel Quantity – CHECK
   This is done by reading the G1000 indicator. Remember - 20 gallons per tank maximum usable. Also, the tank can only indicate 17 gallons via the sensors. You must use either the fuel measuring device to ensure the level or have the fuel visible in each tank. The tank consists of two separate aluminum chambers joined by a flexible hose. There are two smaller vent hoses also. We can only have a 10-gallon maximum imbalance between tanks.
   h. Hobbs AND Tach Times - VERIFY
   This measures when the next inspections are due and what you are paying for. Please verify the numbers in the binders are correct. Notify dispatch if they are not correct.
   i. Inspection Dates – REVIEWED
   Now that you have reviewed the actual time of the aircraft confirm all inspections are current.
15. Master Switch – OFF
16. Trim - CHECK OPERATION
   The trim control should move smoothly full forward and aft. Return it to the take off position after you check the movement.

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<th>Left wing</th>
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1. Rear Ventilation Intake – INSPECT
   This is found above the tire on the underside of the wing. This allows fresh outside air to go to vents in the back seat. During cold weather months a bright yellow baffle should be in place to prevent freezing the occupants in the back seat.
2. Left Gear Strut – INSPECT
   It should be symmetrical with the right gear strut. It is a spring-steel strut meant to absorb hard landings. If there is something wrong with the gear it will not be symmetrical and will cause the wing to be slightly lower. It could also have cracks if too hard of a landing occurred.
3. Wheel & Tire – INSPECT
   Here you are looking for flat spots or uneven wear. This will include moving the aircraft forward to inspect the entire circumference of the tire. If there are cords showing in the layers under the rubber surface, then the tire needs to be changed prior to the flight. The wheel is checked to make sure the cotter pin is in place and there is no fatigue or nicks/dents in the metal.
4. Chocks – REMOVE
   Please place them in the back of the airplane or temporarily on the wing. You will be tempted to place them on the step, if left there and you take-off they will clobber the bottom of the wing and have the potential to down the aircraft for multiple days to fix the aircraft. Just put them on the wing so they can slide off or in the back of the aircraft.
5. Opening Around Tank Drain - INSPECT
   This is to look for anything touching the tanks, drains, or holes that might develop in the tank, etc. We are looking to see the drain centered, no fuel leaking, and a gap between the wings lower surface and the aluminum tank.
6. Wing Surface – INSPECT
IT SHOULD BE SMOOTH WITH NO CRACKS OR VISIBLE ANOMALIES. AND THERE SHOULD BE SCREWS IN ALL THE ACCESS PANELS ON THE BOTTOM OF THE WING.

7. (2) Stall Strips – INSPECT
   THESE STRIPS ARE DESIGNED TO PROVIDE EARLY STALL INDICATIONS BY SEPARATING AIRFLOW SOONER AT HIGHER ANGLES OF ATTACK. THEY ARE INSTALLED ON THE LEADING EDGE OF THE WING. THE FIRST STRIP WILL BE AT THE BASE OF THE WING CLOSE TO THE WALK STRIP. THERE SHOULD BE A SMALL DIVOT IN THIS STRIP. THAT IS THE LOCATION TO PLACE THE FUEL MEASURING DEVICE TO GIVE A CONSISTENT READING OF FUEL IN THE TANKS. THE SECOND STRIP IS OUT IN FRONT OF THE AILERON TO PROVIDE AN EARLY BUFFET OVER THE CONTROL SURFACE. IT IS MUCH SMALLER IN LENGTH AND PROTRUDES LIKE A TRIANGLE FORWARD INTO THE WIND. STALL STRIPS ALSO PROVIDE A MORE CONTROLLED STALL ACROSS THE LENGTH OF THE WING.

8. Stall Warning - REMOVE COVER & INSPECT
   THE STALL WARNING HOLE HAS A CLEAR HOSE HOOKED UP TO A REED INSIDE THE COCKPIT. AS THE AIR FLOW SLOWS AND THE ANGLE OF THE WING ADJUSTS IT CREATE A VACUUM THAT WILL SUCK OUT THE AIR CAUSING THE REED TO VIBRATE. YOU CAN REPLICATE THE VACUUM BY SUCKING ON THE STALL WARNING HOLE UNTIL YOU HEAR THE REED. MAKE SURE THE HOLE IS CLEAR OF ANY BUGS OR DEBRIS.

   THIS IS WHEN YOU WILL VERIFY THE FUEL QUANTITY THAT YOU SAW IN THE G1000. THE CAP SHOULD BE ATTACHED TO THE TANK WITH A METAL CABLE, AND THE GASKET SHOULD LOOK CLEAN AND IN GOOD CONDITION. A POOR GASKET COULD ALLOW WATER TO LEAK INTO THE FUEL TANK. WE ALWAYS RETURN THE FUEL CAP WITH THE TAB FOLDING BACK TOWARDS THE AILERON.

10. Landing Light Housing – INSPECT
    THERE SHOULD BE NO CRACKS, NO VISIBLE SIGNS OF ELECTRICAL SHORTS (SUCH AS BLACK MARKS) AND THE LIGHTBULBS YOU CHECKED EARLIER ARE FUNCTIONING.

11. Fuel Tank Vents – INSPECT
    IN COLD CONDITIONS WATER COULD FREEZE AROUND THE VENTS NOT ALLOWING FUEL TO DRAIN OUT. THIS COULD BE DETRIMENTAL TO FLIGHT. VERIFY THAT THERE IS NO MOISTURE AROUND THE VENTS.

12. Pitot-Static Mast – REMOVE COVER & INSPECT
    YOU ARE LOOKING FOR THREE HOLES. FORWARD, AFT AND Underside of THE MAST. THE FORWARD HOLE IS THE PITOT HOLE; IT SHOULD BE CLEAR AND FREE. THE BOTTOM IS A DRAIN HOLE, THIS TOO SHOULD BE CLEAR AND FREE OF OBJECTS. THE BACK SIDE IS THE STATIC PORT, AGAIN CHECK TO VERIFY FREE AND CLEAR OF OBJECTS. BLOCKAGE OF ANY OF THESE COULD LEAD TO INCORRECT INFORMATION BEING DISPLAYED ON THE G1000. VERIFY THEY ARE CLEAR.

13. Wing Tip & Light Assembly – INSPECT
    THE WING TIP SHOULD BE SECURE, AND THE LIGHT ASSEMBLY SHOULD BE SECURED BY 2 SCREWS. THE STROBE COVER SHOULD HAVE NO CRACKS AND SCREWED IN TIGHT. THE FORWARD LENS WILL BE RED IN COLOR FOR THE LEFT WING.

14. (2) Static Wicks – INSPECT
    THEY SHOULD BE HORIZONTAL, ANY CURVE OR BEND IN THE WICK COULD BE A BROKEN STATIC WICK AND SHOULD BE LOOKED AT BY A MECHANIC.

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### Aileron (Left)

1. Aileron Paddle – INSPECT
   GENTLY LIFT THE AILERON AND INSPECT THE INSIDE OF THE PADDLE. MAKE SURE THERE IS NOTHING INSIDE AND NO CRACKS OR DENTS ON ANY SURFACE. AILERON PADDLES AID IN DIRECTIONAL CONTROL DURING A TURN AND COUNTERACT ADVERSE YAW.

2. Hinges & Safety Pins – INSPECT
   THERE ARE FOUR HINGES ON THE AILERON. CHECK THE CONNECTION AND ALIGNMENT OF THE HINGE PINS. ALSO CHECK FOR WEAR AND TEAR.

3. Push Rod, Bracket, & Bonding Straps – INSPECT
   CHECK THE PUSH ROD’S CONNECTION. MAKE SURE THE LOCK NUT IS PRESENT AND TIGHT. CHECK THE ATTACHMENT OF THE BRACKET AND IF THERE ARE ANY CRACKS OR DENTS. ON THE PUSH ROD, THERE IS A BONDING STRAP. CHECK THE BONDING STRAP IS IN A GOOD CONDITION AND CONNECTED ON BOTH ENDS.

4. Trim Tab - INSPECT (don't touch!)
   THERE IS A TRIM TAB ATTACHED ON THE AILERON. ONLY MAINTENANCE IS ALLOWED TO ADJUST THIS TAB, THEREFORE, YOU SHOULD NOT ADJUST IT. VISUALLY INSPECT ITS ATTACHMENT BY FOUR BOLTS AND NUTS. VERIFY THEY ARE TIGHT.

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### Flap and Gear

1. Counterweight – INSPECT
   THE COUNTERWEIGHT IS TO HELP THE FLAP DEPLOY AND TO COUNTER AGAINST FLUTTER. CHECK FOR OBSTRUCTIONS BEHIND THE COUNTERWEIGHT SO THE COUNTERWEIGHT CAN GO UP WHEN THE FLAP IS DEPLOYED.

2. Hinges & Safety Pins - INSPECT
   THE FLAP IS ATTACHED ON THE WING WITH 6 HINGES. CHECK ALL HINGES FOR ALIGNMENT AND CONNECTION. CHECK FOR GENERAL WEAR AND TEAR.

3. Push Rod, Bracket, & Bonding Straps – INSPECT
   ON THE FLAP PUSH ROD, CHECK THE CONNECTION AND MAKE SURE THE LOCK NUT IS PRESENT AND TIGHT. CHECK THE BRACKET’S ATTACHMENT AND CONDITION. CHECK THE BONDING STRAP IS IN A GOOD CONDITION AND CONNECTED ON BOTH ENDS.

4. Torsion Tube & Bonding Strap – INSPECT
   MAKE SURE THE TORSION TUBE IS PRESENT AND THE NUTS AT EACH END ARE TIGHT AND THE PAINT MARKS ON BOTH ENDS ARE ALIGNED. THE TORSION TUBE HAS A LITTLE PLAY IN IT AND SHOULD BE FELT WITH YOUR HAND. CHECK THAT THE BONDING STRAP IS IN GOOD CONDITION AND CONNECTED ON BOTH ENDS.

5. Main Gear - INSPECT FROM AFT
   IT SHOULD BE SYMMETRICAL WITH THE RIGHT GEAR STRUT. IT IS A SPRING-STEEL STRUT MEANT TO ABSORB HARD LANDINGS. IF THERE IS SOMETHING WRONG WITH THE GEAR IT WILL NOT BE SYMMETRICAL AND WILL CAUSE THE WING TO BE SLIGHTLY LOWER. IT COULD ALSO HAVE CRACKS IF TOO HARD OF A LANDING OCCURRED.

   HYDRAULIC DISC BRAKES. CHECK BRAKE CONDITION AND MAKE SURE THE HYDRAULIC LINE IS WELL ATTACHED TO THE MAIN GEAR. IN ADDITION, CHECK IF THERE IS ANY HYDRAULIC LEAKAGE ALONG WITH THE LINE AND THAT THERE AREN’T ANY PUDDLES OF BRAKE FLUID UNDER THE BRAKES THEMSELVES. THE BRAKE CALIPER SHOULD BE SECURELY ATTACHED TO THE STRUT.
7. **Brake Pad - VERIFY SUFFICIENT THICKNESS**


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**Left Fuselage**

1. **Rear Cabin Door & Window – INSPECT**

WITH THE REAR DOOR CLOSED, IT SHOULD SIT FLUSH TO THE FUSELAGE. WHEN OPENING THE DOOR, THE HANDLE SHOULD COME OUT SMOOTH AND THE DOOR SHOULD ALSO OPEN SMOOTHLY AND NOT BIND ON ANYTHING. CLEAN THE GLASS IF NEEDED, MAKE SURE THERE ARE NO CRACKS OR DEEP SCRATCHES IN THE GLASS.

2. **Rear Door Pins – INSPECT**

WITH THE REAR DOOR HELD OPEN, CLOSE THE DOOR HANDLE TO EXPOSE THE LOCKING PINS. THERE YOU WILL BE ABLE TO SEE TWO PINS COMING OUT FROM THE FRONT AND REAR SIDE OF THE DOOR. BOTH PINS WILL GO IN AND OUT SMOOTHLY AS YOU OPEN AND STOW THE HANDLE. THEY SHOULD BE TIGHT WITH NO ROTATIONAL MOVEMENT. THEY CAN ROTATE ENOUGH TO FALL OFF INSIDE THE DOOR. IF THEY ARE LOOSE, NOTIFY MAINTENANCE PRIOR TO THE FLIGHT TO HAVE THEM TIGHTEN THE PINS.

3. **Fire Extinguisher - CHARGED & SECURED**

THE FIRE EXTINGUISHER IS LOCATED INSIDE THE REAR PASSENGER COMPARTMENT. THE NEEDLE ON THE GAUGE SHOULD INDICATE IN THE GREEN. IN ADDITION, MAKE SURE IT IS SECURED SO IT DOESN'T MOVE AROUND DURING FLIGHT. AS A SIDE NOTE- THIS IS A HALON EXTINGUISHER- THAT MEANS IT WILL CHEMICALLY REMOVE OXYGEN FROM THE ENVIRONMENT TO PUT OUT THE FIRE. IF YOU MUST USE IT IN FLIGHT, HOLD YOUR BREATH AND USE SMALL CONTROLLED BURSTS TO PUT OUT ANY FIRES IN THE COCKPIT. ALSO, THERE ARE ONLY CERTAIN AREAS UNDER THE DASH WHERE THE EXTINGUISHER NOZZLE WILL FIT. FIND ONE OF THOSE HOLES PRIOR TO DEPLOYING THE CONTENTS.

4. **Antennas – INSPECT**


5. **Fuselage Surface – INSPECT**

VISUALLY INSPECT THE GENERAL CONDITION OF THE LEFT FUSELAGE. MAKE SURE THAT THERE ARE NO DENTS, CRACKS, DEEP SCRATCHES, OR ABNORMALITIES.

6. **Tail Skid – INSPECT**

THE TAIL SKID DOES COME IN CONTACT WITH THE GROUND AT TIMES AND GENERALLY WILL SHOW ROUGHNESS/DAMAGE. IF DAMAGE APPEARS TO BE NEW AND OF CONCERN, CONTACT MAINTENANCE. IT COULD INDICATE A HARD LANDING, WHICH WOULD CAUSE THE AIRFRAME TO BE INSPECTED PRIOR TO ANOTHER FLIGHT.

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**Rudder & Elevator**

1. **Cables & Eyelets Left Side - INSPECT**

CABLES SHOULD NOT APPEAR TO BE FRAYED OR LOOSE IN ANY MANNER. THE EYELETS MUST CONTAIN A SMALL AMOUNT OF VISIBLE GREASE IN AND AROUND THE POST THE EYELET IS AROUND. CONTACT MAINTENANCE IF NO GREASE IS VISIBLE.

2. **Bottom Hinge, Mount, & Bonding Strap – INSPECT**

THOUGH THE UPPER RUDDER HINGE IS HARD TO HAVE A LOOK AT, THE BOTTOM HINGE IS AVAILABLE FOR VISUAL INSPECTION. GENTLY DEFLECT THE RUDDER AND HAVE A LOOK AT THE HINGE. MAKE SURE THERE ARE TWO CABLES CONNECTED TO EACH SIDE OF THE HINGE. THERE ARE TWO BONDING STRAPS ON THE TOP AND BOTTOM SIDE OF THE HINGE. THE BONDING STRAP SHOULD BE CONNECTED ON BOTH SIDES AND IN GOOD CONDITION.

3. **Rudder Static Wick (1) - INSPECT**

THERE IS ONE STATIC WICK ON THE RUDDER. IT SHOULD BE STRAIGHT AND HORIZONTAL. IF IT IS BENT OR BROKEN, IT MUST BE CHECKED BY MAINTENANCE.

4. **Trim Tab - INSPECT (don't touch!)**

JUST LIKE THE TRIM TAB ON THE LEFT AILERON, THE RUDDER TRIM TAB IS NOT TO BE TOUCHED (ONLY THE MAINTENANCE IS ALLOWED TO ADJUST IT). IT IS ALSO ATTACHED WITH FOUR BOLTS AND NUTS. CHECK THEIR ATTACHMENT.

5. **Top Hinge – INSPECT**

IT'S KIND OF HARD TO SEE BUT IF IT'S NOT THERE, THE RUDDER WOULD FALL OFF. CHECK FOR SMOOTH MOVEMENT AS YOU MOVE THE RUDDER SIDE TO SIDE.

6. **Lightning Discharge – INSPECT**

THE LIGHTNING DISCHARGE ROD IS LOCATED UNDER THE ELEVATOR NEXT TO THE ELEVATOR PUSH ROD. IT IS ON THE LEFT SIDE TOP, FACING THE RUDDER STRAIGHT ON. THIS IS WHERE THE ELECTRICITY WILL BE DISCHARGED IF THE AIRCRAFT IS STRUCK BY LIGHTNING. MAKE SURE IT’S PRESENT AND IT’S POINTING REARWARD AND NOT LOOSE.

7. **Elevator Surface – INSPECT**

THIS IS ONE OF THE THREE PRIMARY FLIGHT CONTROLS. THIS IS AN AERODYNAMIC FLIGHT CONTROL SURFACE. MAKE SURE THE SURFACE IS SMOOTH AND CLEAN. MAKE SURE THERE ARE NO DENTS OR ANOMALIES.

8. **Elevator Hinges – INSPECT**

THE ELEVATOR IS CONNECTED TO THE HORIZONTAL STABILIZER WITH TWO HINGES ON LEFT AND RIGHT SIDES. GENTLY DEFLECT THE ELEVATOR AND INSPECT BOTH HINGES. THE ELEVATOR SHOULD MOVE FREELY AND NOT BIND ON ANYTHING.

9. **Elevator Static Wicks (2) – INSPECT**

THERE ARE TWO STATIC WICKS, ONE ON EACH SIDE OF THE HORIZONTAL STABILIZER. JUST LIKE OTHER STATIC WICKS, THESE SHOULD BE STRAIGHT AND HORIZONTAL. IF THEY ARE BENT, BROKEN, OR MISSING, HAVE THE MAINTENANCE LOOK AT IT.

10. **Trim Tab, Linkage, Bolts & Safety Wire – INSPECT**
THE PITCH TRIM TAB IS ATTACHED TO THE ELEVATOR AND WAS CHECKED FOR MOVEMENT IN THE COCKPIT CHECK. NOW VISUALLY CHECK ALL THE CONNECTIONS AND SAFETY WIRE. DO NOT TRY TO MOVE THIS TAB WITH YOUR HAND.

11. Cables & Eyelets Right Side – INSPECT
CABLES SHOULD NOT APPEAR TO BE FRAYED OR LOOSE IN ANY MANNER. THE EYELETS MUST CONTAIN A SMALL AMOUNT OF VISIBLE GREASE IN AND AROUND THE POST THE EYELET IS AROUND. CONTACT MAINTENANCE IF NO GREASE IS VISIBLE.

Right Fuselage

1. Tail Skid & Lower Fin – INSPECT
THE TAIL SKID IS CHECKED ON THE RIGHT SIDE AND THERE SHOULD BE NO WRINKLES ON THE TAIL SKID FIN, IT SHOULD BE ALIGNED WITH THE TAIL BOOM AND ATTACHED TO THE BOOM.
2. Fuselage Skin – INSPECT
VISUALLY INSPECT THE GENERAL CONDITION OF THE LEFT FUSELAGE. MAKE SURE THAT THERE ARE NO DENTS, CRACKS, DEEP SCRATCHES, OR ABNORMALITIES.
3. Rear Window – INSPECT
CLEAN THE GLASS IF NEEDED, MAKE SURE THERE ARE NO CRACKS OR DEEP SCRATCHES IN THE GLASS. CHECK THE SEAL BETWEEN THE GLASS AND THE FRAME. IF THERE IS A GAP, LARGE CRACKS, OR AN AREA WHERE THE SEAL HAS PEELED OFF, CONTACT THE MAINTENANCE.

Gear and Flap

1. Main Gear - INSPECT FROM AFT
IT SHOULD BE SYMMETRICAL WITH THE LEFT GEAR STRUT. IT IS A SPRING-STEEL STRUT MEANT TO ABSORB HARD LANDINGS. IF THERE IS SOMETHING WRONG WITH THE GEAR IT WILL NOT BE SYMMETRICAL AND WILL CAUSE THE WING TO BE SLIGHTLY LOWER. IT COULD ALSO HAVE CRACKS IF TOO HARD OF A LANDING OCCURRED.
2. Brakes & Hydraulic Line – INSPECT
HYDRAULIC DISC BRAKES. CHECK BRAKE CONDITION AND MAKE SURE THE HYDRAULIC LINE IS WELL ATTACHED TO THE MAIN GEAR. IN ADDITION, CHECK IF THERE IS ANY HYDRAULIC LEAKAGE ALONG WITH THE LINE AND THAT THERE AREN'T ANY PUDDLES OF BRAKE FLUID UNDER THE BRAKES THEMSELVES. THE BRAKE CALIPER SHOULD BE SECURELY ATTACHED TO THE STRUT.
3. Brake Pads - CONFIRM SUFFICIENT THICKNESS
4. Torsion Tube & Bonding Strap – INSPECT
MAKE SURE THE TORSION TUBE IS PRESENT AND THE NUTS AT EACH END ARE TIGHT AND THE PAINT MARKS ON BOTH ENDS ARE ALIGNED. THE TORSION TUBE HAS A LITTLE PLAY IN IT AND SHOULD BE FELT WITH YOUR HAND. CHECK THAT THE BONDING STRAP IS IN GOOD CONDITION AND CONNECTED ON BOTH ENDS.
5. Hinges & Safety Pins – INSPECT
THE FLAP IS ATTACHED ON THE WING WITH 6 HINGES. CHECK ALL HINGES FOR ALIGNMENT AND CONNECTION. CHECK FOR GENERAL WEAR AND TEAR.
6. Push Rod, Bracket, & Bonding Straps – INSPECT
ON THE FLAP PUSH ROD, CHECK THE CONNECTION AND MAKE SURE THE LOCK NUT IS PRESENT AND TIGHT. CHECK THE BRACKET'S ATTACHMENT AND CONDITION. CHECK THE BONDING STRAP IS IN A GOOD CONDITION AND CONNECTED ON BOTH ENDS.
7. Counterweight – INSPECT
THE COUNTERWEIGHT IS TO HELP THE FLAP DEPLOY AND TO COUNTER AGAINST FLUTTER. CHECK FOR OBSTRUCTIONS BEHIND THE COUNTERWEIGHT SO THE COUNTERWEIGHT CAN GO UP WHEN THE FLAP IS DEPLOYED.

Aileron (Right)

1. Hinges & Safety Pins - INSPECT
THERE ARE FOUR HINGES ON THE AILERON. CHECK THE CONNECTION AND ALIGNMENT OF THE HINGE PINS. ALSO CHECK FOR WEAR AND TEAR.
2. Push Rod, Bracket, & Bonding Straps – INSPECT
CHECK THE PUSH ROD'S CONNECTION. MAKE SURE THE LOCK NUT IS PRESENT AND TIGHT. CHECK THE ATTACHMENT OF THE BRACKET AND IF THERE ARE ANY CRACKS OR DENTS. ON THE PUSH ROD, THERE IS A BONDING STRAP. CHECK THE BONDING STRAP IS IN A GOOD CONDITION AND CONNECTED ON BOTH ENDS.
3. Aileron Paddle – INSPECT
GENTLY LIFT THE AILERON AND INSPECT THE INSIDE OF THE PADDLE. MAKE SURE THERE IS NOTHING INSIDE AND NO CRACKS OR DENTS ON ANY SURFACE. AILERON PADDLES AIDE IN DIRECTIONAL CONTROL DURING A TURN AND COUNTERACT ADVERSE YAW.

Right wing

1. (2) Static Wicks – INSPECT
THEY SHOULD BE HORIZONTAL, ANY CURVE OR BEND IN THE WICK COULD BE A BROKEN STATIC WICK AND SHOULD BE LOOKED AT BY A MECHANIC.
2. Wing Tip & Light Assembly – INSPECT
THE WING TIP SHOULD BE SECURE, AND THE LIGHT ASSEMBLY SHOULD BE SECURED BY 2 SCREWS. THE STROBE COVER SHOULD HAVE NO CRACKS AND SCREWED IN TIGHT. THE FORWARD LENS WILL BE GREEN IN COLOR FOR THE RIGHT WING.
3. Fuel Tank Vents – INSPECT
IN COLD CONDITIONS WATER COULD FREEZE AROUND THE VENTS NOT ALLOWING FUEL TO DRAIN OUT. THIS COULD BE DETRIMENTAL TO FLIGHT. VERIFY THAT THERE IS NO MOISTURE AROUND THE VENTS.
4. Fuel Tank – CHECK CAP AND FUEL QUANTITY
This is when you will verify the fuel quantity that you saw in the G1000. The cap should be attached to the tank with a metal cable, and the gasket should look clean and in good condition. A poor gasket could allow water to leak into the fuel tank. We always return the fuel cap with the tab folding back towards the aileron.

5. Wing Surface – INSPECT

It should be smooth with no cracks or visible anomalies. And there should be screws in all of the access panels on the bottom of the wing.

6. Stall Strips – INSPECT

These strips are designed to provide early stall indications by separating airflow sooner at higher angles of attack. They are installed on the leading edge of the wing. The first strip will be at the base of the wing close to the walk strip. There should be a small divot in this strip. That is the location to place the fuel measuring device to give a consistent reading of fuel in the tanks. The second strip is out in front of the aileron to provide an early buffet over the control surface. It is much smaller in length and protrudes like a triangle forward into the wind. Stall strips also provide a more controlled stall across the length of the wing.

7. Opening Around Tank Drain - INSPECT

This is to look for anything touching the tanks, drains, or holes that might develop in the tank, etc. We are looking to see the drain centered, no fuel leaking, and a gap between the wings lower surface and the aluminum tank.

8. Right Gear Strut – INSPECT

It is symmetrical with the left gear strut. It is a spring-steel strut meant to absorb hard landings. If there is something wrong with the gear it will not be symmetrical and will cause the wing to be slightly lower. It could also have cracks if too hard of a landing occurred.

9. Wheel & Tire – INSPECT

Here you are looking for flat spots or uneven wear. This will include moving the aircraft forward to inspect the entire circumference of the tire. If there are cords showing in the layers under the rubber surface, then the tire needs to be changed prior to the flight. The wheel is checked to make sure the cotter pin is in place and there is no fatigue or nicks/dents in the metal.

10. Chocks – REMOVE

Please place them in the back of the airplane or temporarily on the wing. You will be tempted to place them on the step, if left there and you take off, they will clobber the bottom of the wing and have the potential to down the aircraft for multiple days to fix the aircraft. Just put them on the wing so they can slide off or in the back of the aircraft.

Underside

1. OAT Probe – INSPECT

The outside air temperature probe is located on the right cockpit fuselage (facing the tail) next to the entrance step along with the grounding tab. Make sure it's there and clean. (No ice or dead bugs on the probe).

2. Cowl Exit – INSPECT

Cowl exit is the open area behind the nose gear assembly. Inspect this area to make sure there aren't any foreign objects. In addition, engine exhaust is installed through a separate cowl hole. Visually inspect the exhaust without touching (it could be hot). It can cause burns when it is hot. If exhaust is cool (by feeling the air around the exhaust), make sure the exhaust is bolted on tight and no visual cracks or anomalies exist.

3. Oil Cooler – INSPECT

For fixed pitch DA-40’s, the oil cooler is visible in the cowl exit on the left side. Visually inspect that there are no dings or dents and it should be clear of any debris.

4. Nose Gear/Shock Absorber – INSPECT

If there is a crack or any damage call maintenance. While the main gears are spring steel, the nose gear absorbs shock by the elastomer package.

Nose

1. Right Front Ventilation Intake – INSPECT

This allows fresh outside air to go to vents in the front of the cabin.

2. Oil Level - CHECK (recommended 6 quarts)

Oil level must be checked prior to every flight. Usu minimum is 6 quarts. Checking oil level with a hot engine could cause burns. A hot engine could make it hard to read the oil level on the dipstick too, so a cool down time may be necessary. If unsure about the oil level, ask for a second opinion. Do not overfill the engine with oil! We put in one quart at a time, so if the reading is 5 and a half quarts, use the entire quart, bringing the oil level to 6 and a half quarts. If the airplane has just undergone an oil change the oil could be light almost clear. If this is the case, verify with a paper towel or cleaning rag, it should get moist. Oil color can range from light gold color to almost black. The darker it is the closer it is to its next 100-hour inspection.

3. Right Cowling & Fasteners – INSPECT

The upper and lower cowlings are easy to remove and only held in with fasteners. When a fastener is loosened it will pop out due to the screw having a spring in it. Reinstalling (fastening) a popped screw is allowed, if there are multiple popped screws contact maintenance. Check the cowling for cracks, burn marks, discoloration, oil streaks, etc.

4. Spinner & Fasteners – INSPECT

The spinner is also held on with fasteners. These should all be tight and flush with the surface of the spinner. Tightening of a fastener may be required if loose. Check the spinner for dents and overall tightness. Never push on the spinner when moving an aircraft!

5. Propeller – INSPECT
MAKE SURE THE PROPELLER IS FREE OF DAMAGE, DINGS, NICKS, AND ROUGH SPOTS. IT SHOULD HAVE A SMOOTH LEADING EDGE. AND THE BACKSIDE SHOULD BE BLACK IN COLOR. ALWAYS PLACE THE PROPELLER IN A HORIZONTAL POSITION, ESPECIALLY IN THE HANGARS. THIS KEEPS THE ACCIDENT OF PUSHING A TAIL INTO A VERTICAL PROP MITIGATED.

6. Engine Cooling Intakes – INSPECT
THE INTAKES MUST BE FREE OF ANY DEBRIS TO ENSURE PROPER COOLING. IF THE PLANE HAS BEEN SITTING FOR A WHILE, CHECK FOR NESTS FROM BIRDS AND INSECTS. IN THE WINTER/COLD MONTHS, THERE WILL BE A BRIGHT YELLOW PLATE INSTALLED IN THE HOLES. MAKE SURE THEY ARE THERE. IF YOU ANTICIPATE FLYING TO A WARMER CLIMATE OR IF THE OUTSIDE AIR TEMPERATURE IS ABOVE THE MIN. TEMP. NOTED ON THE PLATES, REMOVE THE PLATES. IT SHOULD BE REMOVED PRIOR TO FLIGHTS INTO WARMER WEATHER.

7. Alternator & Battery Case Blast Tube – INSPECT
VERIFY THE BLAST TUBES ARE THERE AND INTACT, NOTHING BLOCKING THE ENTRANCES OF THE TUBES.

8. Engine Intake Air Filter – INSPECT
VERIFY IT IS FREE OF DEBRIS, NESTS, TOO MANY DEAD BUGS, ETC. COLD WEATHER KIT SHOULD BE INSTALLED DURING THE COLD MONTHS AND REMOVED FOR THE WARMER MOTHS/TEMPERATURES.

9. Heater Air Intake – INSPECT
MUST BE FREE OF DEBRIS/OBJECTS

10. Oil Cooler Intake – INSPECT
MUST BE FREE OF DEBRIS/OBJECTS. WILL ALSO BE COVERED IN WINTER WITH A PLATE THAT HAS A RELATIVELY VERY SMALL HOLE.

11. Nose Gear & Nose Fork – INSPECT

12. Wheel – INSPECT
VISUALLY INSPECT THE ENTIRE CIRCUMFERENCE OF THE TIRE. CHECK FOR SLIP MARKS. IF THERE ARE COROS SHOWING IN THE LAYERS UNDER THE RUBBER SURFACE, THE TIRE NEEDS TO BE CHANGED PRIOR TO THE FLIGHT.

13. Left Front Ventilation Intake – INSPECT
MUST BE FREE OF DEBRIS/OBJECTS.

14. Left Cowling & Fasteners – INSPECT
THE UPPER AND LOWER COWLINGS ARE EASY TO REMOVE AND ONLY HELD IN WITH FASTENERS. WHEN A FASTENER IS LOOSED IT WILL POP OUT DUE TO THE SCREW HAVING A SPRING IN IT. CONTACT MAINTENANCE TO FASTEN THE SCREW. CHECK THE COWLING FOR CRACKS, BURN MARKS, DISCOLORATION, OIL STREAKS, ETC.

PREFLIGHT INSPECTION and WALK AROUND are found in chapter 4A.4 of the AFM.

AT ANY TIME, THE PIC MAY REFERENCE THE AFM FOR A BETTER UNDERSTANDING.

Flight Portion

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Before Engine Start

1. Pilot Documents – ONBOARD
THIS INCLUDES PHOTO ID SUCH AS DRIVER’S LICENSE OR PASSPORT IF YOU ARE FROM OUTSIDE THE USA. THE ORIGINAL MEDICAL AND PILOTS’ LICENSES ARE ALSO REQUIRED TO BE ONBOARD.

2. Flight Plan – COMPLETE
FLIGHT PLANS ARE REQUIRED ANY TIME THE FLIGHT IS LEAVING THE VALLEY. THE THREE LOCATIONS WHERE A FLIGHT PLAN IS NOT NEEDED ARE, KLGU, KBMC, AND U10.

3. Passenger Briefing - COMPLETE
SEE THE BRIEFING SECTION

4. Preflight Inspection – COMPLETE
AS OUTLINED ABOVE

5. Times & Inspections – VERIFIED
TIMES INDICATE THE 100-HOUR INSPECTION AS PER THE FAA IN THE FAR’S. THIS NEEDS TO BE COMPLIED WITH. THERE IS NO WAY AROUND THE FAR, YOU CANNOT FLY FOR 101-HOURS. FOR FLIGHT INSTRUCTION IT MUST HAVE BEEN INSPECTED WITHIN THE PRECEDING 100-HOURS OF ANY FLIGHT. OTHER AIRWORTHINESS DIRECTIVES (AD) ARE ALSO TRACKED BY TIME. THE INSPECTIONS REQUIRED TO BE CURRENT ARE- ANNUAL, TRANSPONDER, VOR CHECK, ELT CHECKS, ALTIMETER, AND PITOT-STATIC CHECKS.

6. Rear Door - CLOSED & LATCHED
VERIFY THAT THE DOOR HAS BEEN CLOSED AND THE RED LATCH IS IN AND FLUSH WITH THE DOOR. A RED DOOR WARNING MESSAGE WILL APPEAR ON THE G1000 IF NOT CLOSED AND LATCHED.

7. Baggage – SECURE
ANYTHING NOT SECURE COULD BECOME A PROJECTILE IN THE EVENT OF AN EMERGENCY OF ANY KIND.

8. Safety Harnesses - FASTENED

9. Rudder Pedals – ADJUSTED
HEELS ON THE FLOOR WITH THE TOES OF YOUR FEET ON THE RUDDER BARS. A SLIGHT MOVEMENT OF THE FEET ALLOWS THE TOES TO ACTIVATE THE BRAKES. WE VERIFY THAT WE ARE NOT “ON-THE-BRAKES” HERE SO WHEN WE LAND, WE DON’T INADVERTENTLY LAND WITH OUR FEET ACTIVATING THE BRAKES.

10. Flight Controls - FREE & CORRECT
10-minute Limit for Avionics with the engine and alternator off.

20. Annunciators - NORMAL
Normal does not mean there are no messages, just that the ones that are on are "normal" for the situation. For example, a red "Low Oil Pressure" message will indicate at this stage because the engine is not running to create oil pressure.

21. Brakes - HOLD
Don't assume the parking brake is always sufficient to hold the plane in place once the engine starts. Toes are on the top of the pedal and sufficient pressure should be applied to keep the plane from moving once started.

22. Throttle - ¼” TRAVEL OPEN
Throttle should be advanced ¼” up from the idle position. This will keep the engine from instantly going to an excessive RPM.

23. Mixture - RICH
Advance the mixture control to the maximum forward position.

24. Fuel Computer - ENTER AMOUNT
Enter the amount known to be in the fuel tank. It's better to be on the lower end than the higher end entered. If the tanks were topped off, press the fuel reset button and then decrease the total amount by a gallon or two.

25. Fuel Selector - LOWEST TANK
Refer to the preflight or the fuel gauges to know which tank is lowest.

26. V-speeds - SET
Most commonly the Glide Speed is the one that will need to be set, and this is figured by weight of the aircraft *SEE AFM.

### Engine Start

1. Front Canopy - POSITION 1 OR 2
The front canopy window has two positions. Position 1 is when it's completely closed and locked. And Position 2 is when it's slightly opened but locked with the pins. (There are four holes on the part where the front canopy sets, two on each side of the cockpit. The lower holes are for Position 1, and the upper holes are for Position 2.)

2. Strobes - ON
Make sure to turn on the strobe lights so people around the area know the engine is going to run or is running. However, even though the strobes are the indication of a running engine, you will not turn this on during the night time because it will possibly blind people around and yourself. At night time, you will turn on the position lights instead and you will turn the strobes on right before you enter the runway.

3. Brakes - HOLD
Though the parking brake is set at this point, you must ensure that you are holding the brake tight. When the engine starts, it will produce strong forward force. It can be more than the parking brake can handle.

4. Fuel Pump - ON (verify noise)
Turn on the fuel pump switch. There are two fuel pumps in the DA 40. One runs by an electric motor and is controlled by a switch on the dash, and the other runs mechanically by the engine. The engine driven fuel pump runs automatically when the engine is running. However, the electric fuel pump runs when the fuel pump switch is on. Once the fuel pump switch is on, you should be able to hear the electric fuel pump.
PUMP MOTOR. VERIFY THAT YOU HEAR THE MOTOR NOISE TO KNOW THE FUEL PUMP IS WORKING. THE PUMP MUST BE ON, THE MIXTURE OPEN, AND THE THROTTLE PARTWAY OPEN TO PRIME THE ENGINE. IF IT IS CLOSED- NO FUEL WILL ENTER THE CYLINDERS.

5. Prime
THE PURPOSE OF PRIMING THE ENGINE IS TO INTRODUCE FUEL INTO THE CYLINDERS. DO NOT PRIME FOR TOO LONG. LONG PRIMES CAN CAUSE AN ENGINE FIRE WHEN YOU ENGAGE THE STARTER.
   a. Cold Engine ~ 4-7 SECONDS
   b. Warm Engine ~1-3 SECONDS

6. Fuel Pump – OFF
TURN OFF THE FUEL PUMP SWITCH.

7. Propeller Area – CLEAR
SHOUT OUT LOUD "CLEAR PROP!" TO ALERT PEOPLE THAT THE ENGINE IS GOING TO START THE ENGINE. THIS IS SO THEY CAN CLEAR THE AREA. VISUALLY MAKE SURE THE AREA IS CLEAR PRIOR TO STARTING THE ENGINE.

8. Ignition Switch – START
PUT THE KEY IN AT THIS POINT AND ENGAGE THE STARTER. HOLD UNTIL THE ENGINE STARTS. YOU MUST KEEP THE OTHER HAND ON THE THROTTLE TO CONTROL THE RPM ONCE THE ENGINE HAS STARTED. AVOID TOO HIGH OF AN RPM AFTER THE ENGINE STARTS. THE TIMED STARTING LIMITS HELP KEEP THE STARTER FROM BURNING OUT AND THE BATTERY FROM BEING EXCESSIVELY TAXED DURING THE START PROCESS.

10 Second limit for Starter being engaged. After operating the starter motor, let cool for 20 sec. After 6 start attempts, allow the starter to cool for 30 mins.

After Start

1. Throttle - SET 1000 RPM
MONITOR THE RPM GAUGE ON THE MFD, SET TO 1,000 RPM.

2. Oil Pressure – GREEN WITHIN 15 SECONDS
THE OIL PRESSURE WILL COME UP WHEN THE ENGINE STARTS. CHECK THAT THE OIL PRESSURE GAUGE RAISES AND STABILIZES IN THE GREEN ARC WITHIN 15 SECONDS OF STARTING.

3. Ammeter – GREEN
WHEN THE ENGINE STARTS TO RUN, THE ALTERNATOR WILL RUN TOO. CHECK THE AMMETER AND MAKE SURE THE CURRENT IS IN THE SAFE RANGE (AMMETER INDICATING IN GREEN ARC).

4. Fuel Flow – GREEN
AS THE ENGINE RUNS, THE ENGINE DRIVEN FUEL PUMP IS RUNNING TOO. CHECK THE FUEL FLOW TO ENSURE PROPER QUANTITY OF FUEL IS FLOWING TO THE ENGINE (FUEL FLOW IN GREEN ARC).

5. Mixture - LEAN FOR TAXI
LEAN THE MIXTURE FOR TAXI. GENERALLY DONE AT PILOT’S DISCRETION BUT DO NOT LEAN IT SO MUCH THAT THE ENGINE STARTS TO SPUTTER. EXPERIENCE HAS SHOWN THAT MOVING THE LEVER DOWN ONE TO TWO LETTERS ON THE WORD “MIXTURE” IS SUFFICIENT.

G1000 Setup

1. Avionics Master – ON
TURN ON THE AVIONICS MASTER. THE BOXES FOR COM2 AND NAV2 SHOULD NO LONGER HAVE RED X’S IN THEM AND YOUR HEADSETS SHOULD BE ON THIS POINT TO DO A COMM CHECK WITH THE PERSON SITTING NEXT TO YOU. IF YOU HAVE PASSENGERS, MAKE SURE THEY CAN HEAR YOU TOO.

2. Comms – SET WX & CNLC or CTAF
TYPICALLY, COMM 1 IS USED FOR CTAF/TOWER AND COMM 2 IS USED FOR ASOS/ATIS OR USU OPS BUT THEY CAN BE USED HOWEVER THE OPERATOR DESIRES.

3. ATIS (weather) - OBTAIN
LISTEN TO ASOS/ATIS TO DETERMINE THE ALTIMETER SETTING AND THE WINDS FOR THE RUNWAY IN USE.

4. Altimeters (G1000 & Standby) – BARO SET
SET THE ALTIMETER TO THE CURRENT SETTING RECEIVED FROM ASOS/ATIS. SET BOTH THE G1000 AND STANDBY ALTIMETERS.

5. Heading Bug - SET RUNWAY HEADING
SET THE HEADING BUG TO THE RUNWAY WHICH IS IN USE DETERMINED BY THE WX REPORTING SERVICE. IF NO WX REPORTING IS AVAILABLE, LOOK AT THE WINDSOCK TO DETERMINE THE BEST SUITABLE RUNWAY.

6. Altitude Bug – SET
SET THE ALTITUDE BUG TO YOUR CRUISING ALTITUDE. LATER, IF YOU OBTAIN A CLEARANCE FROM THE ATC, AND THEY ASSIGN YOU A SPECIFIC ALTITUDE, CHANGE THE ALTITUDE BUG TO THE ASSIGNED ALTITUDE.

7. Flight Plan – ENTER
BASED ON YOUR NAVIGATION LOG, ENTER THE WAYPOINTS ON THE G1000 FLIGHT PLAN PAGE.

8. RAIM - CHECK AS NECESSARY
TO CHECK RAIM, GO TO THE THIRD PAGE OF THE AUXILIARY MENU IN THE MFD (TWO CLICKS TO THE RIGHT ON THE BIG FMS KNOB FOLLOWED BY TWO TO THE RIGHT ON THE SMALL FMS KNOB). IT ALSO HELPS TO ADJUST THE TIME OF THE CHECK TO REFLECT THE TIME YOU WILL BE DOING INSTRUMENT APPROACHES OR GPS NAVIGATION.

9. Clearance – OBTAIN
A RADIO CHECK MIGHT BE AN APPROPRIATE SUBSTITUTE AT AN UNCONTROLLED AIRPORT. SOME AIRPORTS WILL HAVE CLEARANCE AVAILABLE FROM THE CONTROLLING FACILITY, OTHERS WILL REQUIRE A PHONE CALL TO GET A CLEARANCE.

10. Transponder - CODE & ALT MODE
FOR VFR FLIGHTS, THE PROPER TRANSPONDER SQUAWK CODE IS 1200. HOWEVER, IF YOU HAVE RECEIVED A SPECIFIC SQUAWK CODE FROM ATC, SET THE TRANSPONDER TO THE CODE YOU ARE ASSIGNED. AS FAR AS ALT MODE GOES, WITH THE UPDATES TO ADS-B, THE TRANSPONDER WILL ALWAYS NORMALLY INDICATE ALT MODE.

11. Pitot Heat – TEST (ammeter must rise)
   TURN ON THE PITOT HEAT AND MONITOR THE AMMETER. AMMETER WILL RAISE IF THE PITOT HEAT IS WORKING NORMALLY. THEN TURN OFF THE PITOT HEAT UNTIL TAKEOFF TO PROTECT IT FROM OVERHEATING.

12. Ammeter – GREEN
   AFTER PITOT HEAT TEST, CHECK THE AMMETER AGAIN FOR THE GREEN ARC INDICATION.

13. Annunciations – NORMAL
   NORMAL DOES NOT MEAN THERE ARE NO MESSAGES, JUST THAT THE ONES THAT ARE ON ARE "NORMAL" FOR THE SITUATION, FOR EXAMPLE, AFTER PITOT HEAT TEST, “PITOT HEAT OFF” WILL BE SHOWN IN THE ANNUNCIATION WINDOW.

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**Before Taxi**

1. Taxi Brief – ACCOMPLISH
   TAKE OUT THE AIRPORT DIAGRAM AND BRIEF THE TAXI ROUTE THAT YOU ARE PLANNING ON. IF YOU ARE AT A TOWERED AIRPORT, BRIEF THE ROUTE THAT YOU ARE ASSIGNED BY GROUND CONTROL.

2. Taxi Light – ON
   THE LANDING LIGHT CAN BE ON TOO FOR MORE INCREASED LIGHTING AT NIGHT.

3. Interior Lighting - AS REQUIRED
   DURING THE DAY NO LIGHTING IS REQUIRED TO SEE THE INSTRUMENTS. DURING NIGHT CONDITIONS, THE INSTRUMENTS AND PANEL LIGHTING SHOULD BE ADJUSTED SO THAT EVERYTHING IS VISIBLE BUT NOT TOO BRIGHT, BEING TOO BRIGHT WILL AFFECT OUTSIDE VISIBILITY BECAUSE OF THE INCREASED GLARE.

4. CO Detector - PRESS TO TEST
   WATCH FOR TWO FLASHES OF THE CO INDICATOR LIGHT. IF THE LIGHT STAYS ON OR DOESN’T FLASH TWICE, CONSULT WITH MAINTENANCE.

5. Door Warning Lights – Off
   IF TAXIING WITH THE CANOPY IN POSITION 2, THERE WILL BE A RED DOOR OPEN MESSAGE. THIS IS NORMAL.

6. Parking Brake – RELEASE
   THE AIRPLANE WILL NOT MOVE IF THE PARKING BRAKE IS STILL SET.

7. Brakes – TEST
   THE BRAKES MUST BE TESTED FROM BOTH SEATS BEFORE THE FULL TAXI IS COMMENCED. AFTER THE FIRST PILOT TESTS THE BRAKES, THEY WILL SAY “YOUR FLIGHT CONTROLS” AND THE OTHER PILOT WILL TEST THEIR BRAKES AND THEN RETURN THE FLIGHT CONTROLS. IF SOLO, ONLY YOUR SIDE WILL NEED TO BE TESTED.

8. Flight Instruments - CHECK ON TAXI
   LOOK AT ALL ALTIMETERS, MAKE SURE THEY MATCH. THEY SHOULD ALL READ WITHIN 75 FEET OF FIELD ELEVATION. VERTICAL SPEED SHOULD READ 0, IF IT DOESN’T, YOU CAN STILL FLY BUT THE NUMBER IT’S ON BECOMES THE NEW 0. INDICATED AIRSPEED SHOULD READ 0, UNLESS THERE’S A STRONG HEADWIND. ATTITUDE INDICATOR MUST BE ERECT AND STABLE, (BOTH G1000 AND BACKUP). THE MAGNETIC COMPASS MOVES FREELY AND HAS NO ABNORMAL BUBBLES IN IT. THE RESERVOIR MUST BE FULL OF FLUID. THE HEADING INDICATOR AND COMPASS SHOULD MATCH. VERIFY HEADINGS CHANGE DURING A GROUND TURN. THE TURN INDICATOR MUST INDICATE IN THE DIRECTION OF THE TURN AND THE “BALL” MUST MOVE FREELY TO THE OUTSIDE OF THE TURN.

9. Taxi Speed – 12 KTS MAX
   TO BEST ACHIEVE THIS SPEED AND AVOID USING THE BRAKES TOO MUCH, SET TAXI RPM AT 1000RPM AND ONLY INCREASE IT WHEN NECESSARY TO MAINTAIN FORWARD MOMENTUM, DECREASING IT AGAIN WHEN APPROPRIATE. THE FAA DESCRIBES THIS AS A "BRISK WALK" AND THE INTENTIONS BEHIND IT ARE TO GET THE PLANE STOPPED AS SOON AS POSSIBLE IF SOME "THING" WERE TO SUDDENLY BE IN FRONT OF YOU.

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**Engine Run-up**

1. Run-up Area – CLEAR
   PAY SPECIAL ATTENTION TO ROCKS, OTHER DEBRIS AND OTHER AIRCRAFT IN THE RUNUP AREA. MAKE SURE YOUR PROPELLER BLAST WILL NOT DAMAGE ANYTHING BEHIND YOU. IF AT AN UNFAMILIAR AIRPORT, ASK ATC WHERE THE RUN-UP AREA IS OR ASK ANY LOCAL PILOTS.

2. Parking Brake – SET
   PUMP THE BRAKES 3 TIMES AFTER SETTING THE PARKING BRAKE TO GET FULL PRESSURE SET ON PARKING BRAKE.

3. Fuel Selector - FULLEST TANK
   LOOK AT THE FUEL GAUGES TO DETERMINE WHICH TANK IS FULLER.

4. Mixture- RICH
   THIS MEANS THE MIXTURE CONTROL LEVER TO THE MOST FORWARD POSITION POSSIBLE–TILL IT CAN’T GO FORWARD ANYMORE!

5. Throttle - 1800 RPM

6. Mixture - LEAN (all USU flights)
   MAKE SURE TO HIT THE "LEAN ASSIST" BUTTON BEFORE ANY LEANING OF THE MIXTURE IS COMMENCED. AS THE MIXTURE LEVER IS PULLED BACK, RPM’S WILL INCREASE. CHT’S WILL RISE ALSO. AT THE POINT WHERE RPM’S START TO DECREASE, ALLOW THE CHT’S TO CONTINUE TO RISE UNTIL THEY MAX OUT AROUND 1450°F. IF WE DON’T LET THE CHT’S MAX OUT, WE WON’T GET THE MIXTURE SET CORRECTLY. ONCE CHT’S ARE STABLE, INCREASE THE MIXTURE LEVER 4 CLICKS. FINE ADJUSTMENT MIGHT BE NECESSARY. WE ARE LOOKING FOR A TEMPERATURE OF APPROXIMATELY 100°F RICH OF PEAK.

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Use the Lean Assist page to set mixture 100°F rich of peak.

7. Carburetor Heat – CHECK
   LOOKING FOR A SLIGHT DROP IN RPM.

8. Magnetos - CHECK (175/50)
175/50 means that no drop in RPM is greater than 175, and that the maximum difference between the two magneto drops is not more than 50.

9. Engine Gauges – GREEN
All of the engine gauges must be in the green arc at this point. If not, consider talking to maintenance about the issue. In winter, oil temperature might not indicate in the green arc. That is normal.

10. Throttle - IDLE CHECK
This check is important! When we do the idle check, we want to make sure that the engine does not turn off due to a carburetor issue or too low of an idle set point. If the engine does turn off during the check, start it back up and take it directly to maintenance. Ideally the engine should go to around 500-600 RPM and stay running.

11. Throttle - SET 1000 RPM

### Before Takeoff

1. Canopy & Windows - CLOSED & LATCHED
Make sure that the front canopy is at position 1. This is when it's completely closed and latched. In addition, ensure that the rear door is also closed and latched. Lastly, make sure there are no door open warning messages on the PFD!

2. Departure Briefing - CLEARANCE
Brief the departure. Which runway are you taking? Are you going to stay in the pattern? Which way and what altitude are you going to depart?

If you have obtained the ATC clearance, what's the departure procedure that you are cleared for? What altitude and heading are you assigned? Etc.

3. Emergency Plan – BRIEF
In addition to the departure brief, brief what you are going to do for an emergency situation. Takeoff segment is one of the most critical phases of flight. Brief what you'll do if an abnormality occurs during the takeoff.

4. Circuit Breakers - CHECK IN
They should all be flush with the surface and moving your hand over them should produce no snags. If a circuit breaker is popped, you will feel it with your hand and visually you will see a white collar around it. Contact maintenance if you discover a popped circuit breaker at this point.

5. Flaps - SET T/O
Make sure that the aircraft is configured for takeoff. This is to produce sufficient amount of lift to support the aircraft for rotation and initial climb at proper airspeed. If flaps are fully retracted, the aircraft will require a faster airspeed for rotation and more runway will be needed. This is not safe.

6. Magneto – BOTH
Prior to takeoff, make sure both magnetos are selected.

7. Annunciator Panel – CHECK
Normal does not mean there are no messages, just that the ones that are on are "normal" for the situation.

8. Carburetor Heat – ON (Temperature BELOW 80° F)

9. Parking Brake – RELEASE
Release the parking brake to taxi to the runway from the run-up area.

### Taxiing onto the Runway

1. Traffic - VISUALLY CLEAR
Make a sure that all 360 degrees are clear of landing traffic prior to taking the runway, this can be accomplished by small S-turns or one 360 degree turn. Make sure that there is no traffic that could create an unsafe situation. Not only do we visually scan for traffic in the pattern, we look at the ADS-B and listen to the radio for situational awareness.

2. Carburetor Heat – OFF
When carburetor heat is on, the warm air going in to the engine is less dense. This will create less engine performance. However, takeoff requires maximum thrust. Therefore, turn the carburetor heat off before taking the runway.

3. Final - "FINAL IS CLEAR"
Visually scan the final leg of the traffic pattern to ensure that you are safe to enter the runway.

4. Runway – BUGGED & "RUNWAY IS CLEAR"
Before crossing the runway hold-short-line, visually check the runway for any objects such as other aircraft, people, animals, ground vehicles, piles of rocks or snow, and so on. Usu aircraft will wait for the runway to be clear prior to advancing into the runway environment.

5. Landing Light - ON (cleared for T/O)

6. Fuel Pump – ON
The electric fuel pump provides redundancy during the takeoff.

7. Pitot Heat – ON
Make sure the Pitot Heat Off message is not present. Pitot heat will remain on for the duration of flight. If it is on for extended periods of time on the ground, it will shut itself down and a "Pitot heat fail" message will appear. This will go away once it cools down enough, and it will automatically turn back on.

### Takeoff Roll

1. HSI - "RWY HDG ### CONFIRMED"
As soon as you line up with the runway, confirm the runway heading to ensure that you are on the correct runway.
2. **Power - “POWER CHECK”** (2200 RPM or more)
   
   Smoothly push the throttle lever fully forward and check the RPM. The RPM must be stabilized at or above 2200 RPM. If the RPM is not at 2200 or above, abort to takeoff.

3. **Airspeed - “AIRSPEED ALIVE”**
   
   During the ground roll, as the aircraft accelerates, the airspeed will show movement. Check the airspeed indicator and make sure your airspeed is increasing.

4. **VR - “59 KTS. ROTATE”**
   
   Once you reach 59 knots, gently apply elevator back pressure and rotate (lift off).

   *Accelerate to climb out speed - 66 KIAS*

---

### 500 Feet AGL

1. **Flaps - VERIFY UP**
   
   At 500 feet AGL, retract the flaps and accelerate to 73 knots for the best rate of climb.

2. **Landing Light – OFF**
   
   The landing light can be left on at pilot’s discretion if you feel like you need to be seen. As soon as you're clear of traffic or busy airspace, turn off the landing light.

   *Accelerate to cruise climb speed - 73 KIAS*

---

### 1000 Feet AGL

1. **Engine Gauges – CHECK**
   
   All of the engine gauges should be in the green arc at this point. If not, consider talking to maintenance about the issue. In winter, oil temperature might not indicate in the green arc. That is normal. During the summer months, we have seen after various touch and go's, the oil temperature will climb into the yellow arc. If this happens, exit the pattern and climb to a cooler temp and allow the oil temp to normalize.

2. **Fuel Pump – OFF**
   
   This is referring to the electric fuel pump. Verify that it has been switched to the "off" position. If left on for too long, especially during warmer months, the electric fuel pumps can and will wear out faster.

3. **Taxi Light - AS REQUIRED**

---

### Level Off - Cruise

1. **Power - SET 2500 RPM**

2. **Mixture - LEAN**
   
   Use Lean Assist Page to Set mixture 100°F rich of peak. Be careful about leaning the mixture at altitude, if you lean it too much the engine may cut-out.

3. **Exterior Lighting - AS REQUIRED**
   
   During day VFR the strobes are always required to be on. In addition, at night, the position lights need to be on. Additional lights may be helpful in certain situations.

4. **Annunciator Panel – CLEAR**
   
   There should be no messages present. If there are messages, they should only be for known issues that appeared during the flight.

5. **Power - SET FOR CRUISE**

   Never allow engine RPM to exceed 2700. Refer to the AFM for exact power settings for specific cruise altitudes.

6. **Engine Gauges – CHECK**
   
   Everything should be in the green arc. If not, determine the reason and decide on whether to continue flight or land. Take into consideration the temperatures outside, if it is cold your temps will be low. Anything within the green arc are considered to be okay. Also, be mindful that if you take off with the cold weather kit and fly to somewhere warm you could cause damage to the engine. Make sure you keep that in you mind as you plan on cross country flights.

7. **Fuel - MANAGE**

   Fuel imbalance MUST NOT exceed 10 gallons between right & left tanks. A message will appear every 15-30 minutes to switch tanks. Before switching tanks, look at the fuel tank quantities and confirm that you are switching to the fuller tank.

---

### Maneuvers

1. **Clearing Turn – COMPLETE**
   
   Clearing turn must be completed prior to each maneuver. This is to ensure the area is clear to prevent a mid-air collision. Either 2-90° degree turns or one 180°

2. **Radio - ANNOUNCE INTENTIONS**
   
   The USU practice areas are non-controlled airspaces. Announce your position, altitude and intentions on CTAF.

3. **Altitude Bug – SET**
   
   Set the altitude bug to your current altitude or an assigned altitude and the G1000 will give you warnings when you are closing in or deviating from the set altitude.

4. **Heading Bug – SET**
   
   Set the heading bug to an assigned heading or desired heading to help maintain or the rollout onto said heading.
5. Emergency Landing Site – SELECTED
ALWAYS ASSESS YOUR SURROUNDINGS BEFORE BEGINNING A MANEUVER. YOU NEVER KNOW WHEN SOMETHING CAN GO WRONG. AWARENESS OF WHAT'S BLOW YOU CAN MEAN THE DIFFERENCE BETWEEN WALKING AWAY FROM AN EMERGENCY LANDING!

6. Airspeed – APPROPRIATE
Each maneuver has a specific speed to perform it at. Make sure you are familiar with what that speed is. Refer to the checklists to get these speeds.

7. Aircraft – CONFIGURED
Configured for the specific maneuver to be performed. Refer to the maneuver checklist to know which configurations to use. You should have a default pitch, power, and airspeed figured out so as to add consistency to your practices. Starting from a known point will improve your maneuvers tremendously.

Fuel pump and carburetor heat should remain OFF during maneuvers unless determined necessary for the safety of flight.

Clean Up Checklist

1. Power - SET ~2350 RPM
2. Carburetor Heat – COLD
VERIFY YOU HAVE MOVED THE CARB HEAT LEVER TO THE COLD POSITION.
3. Mixture – SET
DO NOT ADJUST THE MIXTURE UNLESS YOU ADJUSTED IT UP AT ALTITUDE! AT OUR ALTITUDE WE NEVER RUN WITH THE MIXTURE LEVER IN THE FULL-FORWARD POSITION AS THIS CREATES A TOO RICH SETTING AND CAUSES THE ENGINE TO RUN ROUGH.
4. Fuel Selector - FULLEST TANK
VERIFY ON G1000 WHICH TANK IS THE FULLER TANK. THE FUEL PUMP SHOULD BE ON TO SWITCH TANKS THEN OFF AFTER SWITCHING.
5. Fuel Pump – OFF
SEE ABOVE.
6. Flaps – UP
VERIFY FLAPS HAVE BEEN SET TO THE “UP” POSITION.
7. Lights - AS REQUIRED

Descent/Approach Checklist

1. Circuit Breakers - CHECK IN
THEY SHOULD ALL BE FLUSH WITH THE SURFACE AND MOVING YOUR HAND OVER THEM SHOULD PRODUCE NO SNAGS. IF A CIRCUIT BREAKER IS POPPED, YOU WILL FEEL IT WITH YOUR HAND AND VISUALLY YOU WILL SEE A WHITE COLLAR AROUND IT. CONTACT MAINTENANCE IF YOU DISCOVER A POPPED CIRCUIT BREAKER AT THIS POINT.
2. Exterior Lighting - AS REQUIRED
TURN ON THE LANDING AND TAXI LIGHTS. USE THE STROBE AND POSITION LIGHTS AS REQUIRED.
3. Weather - OBTAIN
LISTEN TO ASOS/ATIS TO DETERMINE THE ALTIMETER SETTING AND THE RUNWAY IN USE.
4. Altimeter (G1000 & standby) - SET
SET THE ALTIMETER TO THE CURRENT SETTING RECEIVED FROM ASOS/ATIS. SET BOTH THE G1000 AND STANDBY ALTIMETERS.
5. Annunciator Panel - CLEAR
6. Engine Gauges - GREEN
7. Fuel Quantity – CHECK
CHECK THE FUEL QUANTITY AND SET THE FUEL SELECTOR FOR THE FULLEST TANK.
8. Fuel Pump – ON
TURN ON THE ELECTRIC FUEL PUMP. THIS IS FOR A REDUNDANCY IN CASE OF GO-AROUND SITUATION.
9. Mixture – ENRICHEN (if leaned)
AS THE ALTITUDE GETS LOWER, THE AIR GETS THICKER. ENRICH THE MIXTURE AS REQUIRED FOR THE ALTITUDE.
10. Carburetor Heat - ON
See CARBURETOR HEAT SOP for proper carburetor heat operation.
11. Fuel Selector - FULLEST TANK
VERIFY THE FUEL SELECTOR IS SET ON THE FULLEST TANK.
12. Safety Harnesses - FASTENED

Final Check

1. Carburetor Heat – COLD
GENERALLY speakiNG, CARBURETOR HEAT REDuces ENGINE PERFORMANCE. TO ENSURE SUFFICIENT THRUST IN CASE OF GO-AROUND SITUATION, TURN OFF THE CARBURETOR HEAT ON FINAL.
2. Flaps – SET
SET THE FLAPS TO THE LANDING POSITION. DEPLOYING FLAPS ALLOWS FOR A STEEPER DESCENT ANGLE.
3. Airspeed – ESTABLISH
FOR USU SOPs, THE FINAL APPROACH SPEED IS 73 KNOTS. HOWEVER, IF TURBULENCE OR WIND SHEAR IS EXPECTED, HIGHER APPROACH SPEEDS SHOULD BE ESTABLISHED.
4. Landing and Taxi Lights – ON
Verify the landing and taxi lights are on.

**Go Around**

1. Throttle – SMOOTHLY APPLY MAX POWER
   Smoothly push the thrust lever fully forward and check the RPM. Check the RPM is stabilized at or above 2200 RPM.
2. Airspeed - 66 KTS
   Accelerate to 66 knots and pitch for the best angle of climb.
3. Flaps – T/O
   Once an airspeed of 66 knots or greater is attained, set flaps to the T/O position and verify the flaps move by either looking outside or inside at the flap light indicators.
4. Go Around – ANNOUNCE
   Fly the aircraft first. Then, when the aircraft speed is established and stabilized for go-around, announce on the radio that you are “going around.”

At 500’ Proceed to 500 Feet AGL checklist

**After Landing Check**

1. Runway Clear – ANNOUNCE
   Once you have crossed the runway hold short line and are verified clear of the runway, announce “clear of the active.”
2. Exterior Lighting - AS REQUIRED
   Probably at this point landing light is no longer needed. Adjust for nighttime conditions. Strobes will come off at this point.
3. Transponder - VERIFY ALT MODE
   Transponder always says ALT mode with change to ADS-B.
4. Carburetor Heat - CHECK COLD
5. Throttle - SET 1000 RPM
6. Mixture - LEAN FOR TAXI
   Just like you did after starting the engine, prior to taxi, lean the mixture for taxiing back to the ramp. Set the mixture to the same place you had it set at when you taxied earlier.
7. Fuel Pump – OFF
   The fuel pumps will overheat if they are left on for the taxi. Make sure they are off!
8. Pitot Heat – OFF
   Place the switch into the “OFF” position.
9. Flaps – UP
   Verify both by looking outside at the flaps and inside at the flap position indicator lights.
10. Taxi Brief – ACCOMPLISH
    Have the taxi diagrams out and brief your taxi. This step is especially important if you are at an unfamiliar airport.
11. Taxi Speed – 12 KTS MAX
    Remember that flight analytics will record any speeds above 12 knots during the taxi.

**Engine Shutdown**

1. Throttle - SET 1000 RPM
2. Parking Brake - SET
3. Avionics Master – OFF
   This will keep any voltage spikes from damaging the avionics.
4. Essential Bus Switch - OFF
5. Exterior Lighting - AS REQUIRED
   Usually only strobes or position lights are required at this point.
6. Mixture - IDLE CUTOFF
   After the engine and propeller stop:
7. Ignition Switch - OFF
8. Key - REMOVE FROM IGNITION
9. Hobbs & Tach Time - RECORD
10. Master Switch - BAT & ALT OFF
11. Exterior Lighting - ALL OFF
12. Instrument & Flood Lights – OFF
   Failure to secure the aircraft could drain the battery and you could be found responsible for the cost of replacing the battery.

**FLIGHT PLAN - CLOSE**

**Aircraft Secure**

1. Tie-Downs – SECURED
   At this point, realize that the $400,000 dollar aircraft is still your responsibility to take care of. Please secure it to the best of your ability including chocks, tie-downs, coverings, gust locks, etc.
2. Chocks - INSTALLED (main landing gear)
3. Pitot Cover - INSTALLED
4. Gust Lock - INSTALLED
5. Stall Warning Cover - INSTALLED
6. Parking Brake - RELEASED (w/Chocks fitted)
7. Personal Items, Trash, etc. - REMOVED
8. Rear Door - CLOSED & LOCKED
9. Windows - CLOSED & LATCHED
10. Front Canopy - CLOSED & LOCKED

PLEASE CLOSE YOUR FLIGHT PLANS- IF THEY HAVE CHANGED, WERE NOT COMPLETED AS PLANNED, ETC. WE EXPECT YOU TO CLOSE ANY FLIGHT PLANS YOU FILE AND OPEN. WE HAVE RECEIVED CALLS AT 2 AM LOOKING FOR A PLANE THAT WAS SAFE IN THE HANGAR AND THE PILOTS WERE AT HOME SLEEPING WHEN THE FILED FLIGHT PLAN EXPIRED. DON’T LEAVE A FLIGHT PLAN OPEN.
Reference Speeds

<table>
<thead>
<tr>
<th>Speed Type</th>
<th>Speed Value</th>
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<tbody>
<tr>
<td>Vso - Landing configuration stall speed</td>
<td>49 KIAS</td>
</tr>
<tr>
<td>Vsi - Clean configuration stall speed</td>
<td>52 KIAS</td>
</tr>
<tr>
<td>Va - Rotation speed</td>
<td>59 KIAS</td>
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<tr>
<td>Vr - Best Rate of climb</td>
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<tr>
<td>Flaps T/O</td>
<td>66 KIAS</td>
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<tr>
<td>Flaps UP</td>
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<tr>
<td>Vref - Normal approach speed</td>
<td>71 KIAS</td>
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<tr>
<td>Vref - Short field approach speed</td>
<td>66 KIAS</td>
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<tr>
<td>Vglide - Best glide speed</td>
<td>73 KIAS</td>
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<tr>
<td>Vere - Flap extend speed</td>
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<tr>
<td>Flaps T/O</td>
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<tr>
<td>Flaps LDG</td>
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<tr>
<td>Va maneuvering speed</td>
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<tr>
<td>&lt;2535 lbs</td>
<td>108 KIAS</td>
</tr>
<tr>
<td>&lt;2161 lbs</td>
<td>94 KIAS</td>
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</tbody>
</table>

Carburetor Heat SOP

NOTE: Carburetor heat should be used as deemed necessary by the pilot to avoid carburetor ice formation!
Carburetor Heat should be used any time carburetor icing is suspected or anytime the potential for carburetor ice is present.
- Carburetor heat will be ON for any descent and may be turned OFF upon leveling-off.
- Carburetor heat will be turned ON during the Downwind and turned OFF with flap application on Base.
- Carburetor heat will be turned OFF 200 feet above MDA orDH on an instrument approach and then used as necessary after arriving at MDA or DH.

Fuel Pump SOP

Fuel Pump should be off when above 500’ AGL unless deemed necessary for the safety of flight. Verify Fuel pressure prior to turning off the fuel pump.

Briefings

Crew coordination is paramount- knowing that the person next to you is actively working towards a common goal. You should brief any time the aircraft is going to move. This includes taxi plans, who is Piloting, any corrections noted verbally (i.e. low altitude, collision hazard like a plane or bird, overlooked items such as carb heat, etc.) and responded to with appropriate action such as- “climbing”, “in-sight”, “correcting” and then the PIC will do the action stated. The Passenger briefing is required by the FAR’s, and the emergency is a USU required briefing, and an excellent habit to form.

Passenger Briefing

To assure safety, anytime that a seat in the back is occupied you must proceed to brief the following using the SAFETY acronym:
- S – Seat belts how to use and adjust them, they must be fastened for taxi, takeoff, landing
- A – Air vents, where they are and how to use. Airsickness and the airsick bags
- F – Fire extinguisher, location and usage plan
- E – Exits including doors how to use in emergency and an emergency evacuation plan
- T – Traffic where it is and how close is it also Talking inside the aircraft.
- Y – Your questions?

Emergency Briefing

To reduce confusion and increase crew coordination we suggest the following, it can be adapted as necessary. Speak up and let the other pilot know what is going on-
- Engine failure or fire on the runway- we will maintain centerline and the pilot not flying will handle the radio calls. We will assess the condition of the aircraft prior to moving on the runway or runway environment.
- Engine failure or fire after rotating- before mid-field we will attempt to return to the runway or land in the airport environment. After mid-field we will look to land free of obstacles such as fences or power lines.
- Below a safe altitude we will look to land free of obstacles within 45° either side of our departure heading.
- At a safe altitude (700’ or above)- we will take the wind into consideration and attempt to return to the airport environment, runways, taxiways, etc.
  - IF out of the pattern we will find an empty area, field or parking lot to put the aircraft down.
Altitude Maneuvers

1. Clearing Turn - COMPLETE
2. Radio - ANNOUNCE INTENTIONS
3. Altitude Bug – SET (AT LEAST 2,000’ AGL)
4. Heading Bug - SET
5. Airspeed - APPROPRIATE
6. Aircraft - CONFIGURED

Fuel pump and carburetor heat should remain OFF during maneuvers unless determined necessary for the safety of flight.

Steep Turns

1. Altitude Maneuvers Checklist – COMPLETE
2. Altitude - AT LEAST 2,000 AGL
3. Airspeed - 95 KIAS (±10 KIAS)
4. Bank - ROLLING THRU 30°
5. Power - INCREASE ~200 RPM

**Enter 360º Turn**
6. Bank Angle - 45°/50° (±5°)
7. Elevator (3-5 degrees above horizon) - MAINTAIN BACK PRESSURE AND TRIM AS NECESSARY
8. Power – AS NECESSARY TO MAINTAIN AIRSPEED
9. Rudder - COORDINATED
10. Roll-out of 360º Turn - LEAD BY 1/2 BANK ANGLE
11. Power – REDUCE AS NECESSARY
12. Elevator- RELEASE BACK PRESSURE, PUSH NOSE DOWN IF TRIMMED BACK DURING MANEUVER

**Repeat maneuver in opposite direction**
13. Clean Up Checklist – PERFORM
   *DON'T FORGET TO RETRIM THE AIRCRAFT IF TRIM WAS USED FOR MANEUVER.*

Slow Flight

1. Altitude Maneuvers Checklist - COMPLETE
2. Altitude - AT LEAST 2,000’ AGL
3. Throttle - 1800 RPM
4. Flaps – APPROACH <108 KIAS/LDG <91KIAS
5. Specified Airspeed - OBTAIN
6. Airspeed - 5-10 KTS ABOVE STALL WARNING
7. Throttle - AS REQUIRED
   About 2050-2250 RPM for level flight
8. Pitch - FOR AIRSPEED (+10 KTS OR +5 KTS)
9. Altitude - HOLD ASSIGNED ALT (±100 FT/±50 FT)
10. Heading - ±10°

**Note:** TURNS IN SLOW FLIGHT ARE TO BE DONE AT A HALF STANDARD RATE TURN. USUALLY FULL POWER WILL BE REQUIRED TO MAINTAIN A CLimb IN SLOW FLIGHT.

**Recovery:**
11. Throttle - FULL
12. Altitude & Heading - MAINTAIN
13. Flaps - T/O, then UP when >75 KIAS
14. Clean Up Checklist - PERFORM
Power-On Stall

1. Altitude Maneuvers Checklist - COMPLETE
2. Altitude - AT LEAST 2,000’ AGL
3. Throttle - 1500 RPM

**As speed decreases to 73 KIAS:**
4. Altitude - MAINTAIN ±100’
5. Heading - ±10° OR MAX 20° BANK IF ASSIGNED

**When speed reaches 73 KIAS:**
6. Throttle - SMOOTHLY APPLY FULL OPEN
7. Pitch - SMOOTHLY 18° NOSE UP AND HOLD
8. Rudder - MAINTAIN COORDINATION
9. Stall Horn - ANNOUNCE “Stall Warning”
10. Stall Buffet - ANNOUNCE “Stalling”

Promptly Initiate Recovery Private Pilots ACS requires a recovery after a full stall occurs. Commercial Pilot ACS requires a recovery at the first indication of a stall.

Recovery:
Simultaneously:
11. Adjust Pitch - REDUCE BACK PRESSURE ~+3°
12. Wings - LEVEL
13. Throttle - VERIFY FULL OPEN

**When Airspeed increases above 60 KIAS:**
14. Pitch - ~5-7°
15. Airspeed - 73 KIAS OR GREATER
16. Clean Up Checklist – PERFORM

Power-Off Stall

1. Altitude Maneuvers Checklist - COMPLETE
2. Altitude - AT LEAST 2,000’ AGL
3. Throttle - 1800 RPM
4. Flaps – APPROACH <108 KTS/ LDG <91 KTS
5. Altitude - MAINTAIN ±100 FT

**When speed reaches 70 KIAS:**
6. Throttle - IDLE
7. Pitch - FOR 70 KIAS (STABILIZED DESCENT)

**Within 100’ of assigned altitude transition to a nose up attitude.**
8. Rudder - MAINTAIN COORDINATION
9. Stall Horn - ANNOUNCE “Stall Warning”
10. Stall Buffet - ANNOUNCE “Stalling”

Promptly Initiate Recovery Private Pilots ACS requires a recovery after a full stall occurs. Commercial Pilot ACS requires a recovery at the first indication of a stall.

Recovery:
Simultaneously:
17. Adjust Pitch - REDUCE BACK PRESSURE ~+3°
18. Wings - LEVEL
19. Throttle - VERIFY FULL OPEN

**When Airspeed increases above 60 KIAS:**
20. Pitch - ~5-7°
21. Airspeed - 73 KIAS OR GREATER
22. Clean Up Checklist – PERFORM
Chandelle

1. Altitude Maneuvers Checklist - COMPLETE
2. Altitude - AT LEAST 2,000 AGL
3. Visual Reference Points - SELECT
4. Airspeed - 95 KIAS

First 90° of Turn:
5. Bank - ROLL TO 30°
6. Power - FULL
7. Pitch - SLOWLY INCREASE
8. Rudder - MAINTAIN COORDINATION
9. 90° Point - MAX PITCH UP (12-15°)

Last 90° of Turn:
10. Bank - SLOWLY REDUCE
11. Pitch - MAINTAIN MAX PITCH UP (12-15°)
12. Rudder - MAINTAIN COORDINATION
13. 180° Point - WINGS LEVEL
14. Airspeed - JUST ABOVE A STALL
15. Heading - ±10°

Recovery:
16. Airspeed - INCREASE TO 95 KIAS
17. Altitude - MAINTAIN AS AIRSPEED BUILDS
18. Heading - ±10°
19. Rudder - MAINTAIN COORDINATION

Repeat maneuver in opposite direction
20. Clean Up Checklist - PERFORM

Lazy Eights

1. Altitude - AT LEAST 2,000 AGL
2. Manoeuvres Checklist - COMPLETE
3. Visual Reference Points - SELECT
4. Power - 2250 - 2300 RPM
5. Airspeed - 95 KIAS

Simultaneously and Slowly increase pitch and bank.

At 45° Point:
6. Pitch - MAX PITCH UP
7. Bank - APPROX. 15°

At 90° Point:
8. Pitch - LEVEL WITH HORIZON
9. Bank - APPROX. 30°
10. Airspeed - AIRSPEED ABOVE A STALL

At 135° Point:
11. Pitch - MAX PITCH DOWN
12. Bank - APPROX. 15°

At 180° Point:
13. Pitch - LEVEL WITH HORIZON
14. Bank - WINGS LEVEL
15. Airspeed - ±10 KTS FROM ENTRY SPEED
16. Altitude - ±100 FT FROM ENTRY ALT
17. Heading - ±10°

Repeat maneuver in opposite direction
18. Clean Up Checklist - PERFORM
Steep Spiral

1. Altitude Maneuvers Checklist - COMPLETE
2. Altitude - AT LEAST 4,000 AGL

This maneuver must be recovered by 1,500’ AGL according to USU SOPs and Commercial ACS.

3. Winds - IDENTIFY
4. Ground Reference Point - SELECT
5. Fuel Pump - ON

*When over selected point:*
6. Power - IDLE
7. Carburetor Heat - ON
8. Airspeed - TRIMMED FOR BEST GLIDE

*While performing maneuver:*
9. Airspeed - BEST GLIDE ±10 KTS
10. Bank - NOT TO EXCEED 60°
11. Ground Track - MAINTAIN AROUND POINT
12. Engine Clear (each rotation)- PERFORM WITH HEADWIND

The maneuver is terminated after performing three, 360° turns around the point or upon reaching 1,500 FT AGL.

13. Clean Up Checklist – PERFORM

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Ground Reference Maneuvers

1. Winds - IDENTIFY
Start all ground reference maneuvers on a downwind.
2. Emergency Landing Site - SELECTED
3. Altitude - 800’ AGL
4. Airspeed - 95 KIAS
5. Power - ~2350 RPM
6. Flaps - Up
7. Fuel Pump - On

---

Pivotal Altitude Calculations
The formula is as follows: ground speed squared divided by 11.3 for knots and ground speed squared divided by 15 for miles per hour.

Remember these are figured in Ground-speed and rounded up.

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<tr>
<th>KTS</th>
<th>MPH</th>
<th>ALT AGL</th>
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<td>87</td>
<td>100</td>
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<td>104</td>
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</table>

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Clean Up Checklist

1. Power – SET ~2350 RPM
2. Carburetor Heat - COLD
3. Mixture - SET
4. Fuel Selector - FULLEST TANK
5. Fuel Pump - OFF
6. Flaps - UP
7. Lights - AS REQUIRED
**ENGINE FAILURE**

1. Airspeed - TRIMMED FOR BEST GLIDE
2. Landing Site - SELECT
   
   If propeller is wind milling
   
   ENGINE RESTART Wind milling Propeller
3. If propeller is stationary
   
   ENGINE RESTART Stationary Propeller
4. If restart is unsuccessful proceed with
   
   ENGINE SECURE

---

ENGINE RESTART Wind milling Propeller

1. Airspeed - 70-130 KIAS
   
   NOTE-WITH A WINDMILLING PROPELLER THE MOST LIKELY CAUSE IS FUEL STARVATION OF SOME KIND, AND THE FOLLOWING STEPS ARE DESIGNED TO FIX THAT PROBLEM.

2. Fuel Selector – SWITCH TANKS
   
   IF YOU EMPTYED ONE TANK, IF THE FUEL FILTER IS CLOGGED FROM TANK TO FUEL LINE, OR A LEAK OR BLOCKAGE IN THE LINE BEFORE THEY COME TOGETHER, THIS WILL FIX THE PROBLEM.

3. Fuel Pump - ON
   
   IF THE MECHANICAL FUEL PUMP FAILED, CAUSING YOUR ENGINE FAILURE, THIS STEP SHOULD FIX THE PROBLEM.

4. Ignition – BOTH
   
   This is to make sure that your ignition didn't accidentally get turned off or to only one magneto.

5. Carburetor Heat – ON
   
   IN THE EVENT OF CARBURETOR ICING CAUSING THE BLOCKAGE OF THE FUEL SYSTEM, THIS STEP WILL SLOWLY START REMOVING THE ICE. BUT MUST BE SELECTED IMMEDIATELY. IF YOU WAIT TOO LONG THERE WILL BE NO RESIDUAL HEAT IN THE COWLILNG TO MELT ANY ICE.

6. Mixture - SET APPROPRIATE (ENRICHEN)
   
   IF THE MIXTURE IS TOO LEAN (DOESN'T HAVE ENOUGH FUEL), THE ENGINE WILL STOP, THUS PUSHING THE MIXTURE LEVER FORWARD WILL RETURN FUEL INTO THE CYLINDER.

   If engine does not start:
   
   7. Mixture - FULL LEAN
   8. Mixture – ADD UNTIL ENGINE STARTS

   If engine will not start proceed with
   
   ENGINE SECURE & EVACUATE

---

ENGINE RESTART Stationary Propeller

1. Airspeed - 70-80 KIAS
2. Fuel Selector – CHECK
   
   SWITCH TANKS
3. Fuel Pump - ON
4. Carburetor Heat - ON
5. Mixture - SET APPROPRIATE
6. Electrical equipment - ALL OFF
   
   MAKE SURE YOU ARE SHUTTING DOWN ALL THE INDIVIDUAL CONSUMERS, SUCH AS LIGHTS, PITOT HEAT AND NOT JUST THE MASTER AND AVIONICS SWITCH.

7. Avionics Master Switch - OFF
8. Master Switch - BATTERY ON
9. Ignition Switch – START
   
   NOTE- THE PRIMER IS NOT MEANT TO BE USED FOR STARTS DURING FLIGHT.

10. Airspeed - INCREASE ABOVE 130 KIAS
    
    THE PURPOSE FOR THIS IS TO GET THE PROPELLER TO WINDMILL AND START THE PLANE WITHOUT THE AID OF THE STARTER.

   Expect at least 1000’ altitude loss

11. Ignition Switch - BOTH
12. Mixture – CHECK
    
    AFTER ENRICHENING THE MIXTURE WITHOUT SUCCESS, TRY PULLING IT BACK TO IDLE AND SLOWLY PUSHING IT FORWARD.

   If engine will not start, proceed with
   
   ENGINE SECURE & EVACUATE

---

ENGINE SECURE

1. Airspeed - TRIMMED BEST GLIDE
2. Announce on Radio- "MAYDAY, MAYDAY, MAYDAY"
3. Safety Harnesses - TIGHTEN
4. Transponder - SQUAWK 7700
   
   When Landing Site assured:
5. Flaps - SET LANDING
6. Fuel Selector - OFF
7. Ignition Switch - OFF
8. Master Switch – OFF

MAKE SURE FLAPS ARE SET APPROPRIATELY BEFORE MASTER GOES OFF AND ELECTRICITY IS ISOLATED TO THE BATTERY.

**Touchdown slowest airspeed**

1. Aircraft - STOP
2. Canopy - OPEN
3. Airplane - EVACUATE IMMEDIATELY
4. Fire Suppressant - USE AS NECESSARY

**ENGINE FIRE In-Flight**

1. Landing Site - SELECT
2. Cabin Heat – OFF
3. Fuel Selector – OFF

THIS IS TO PREVENT GASSES FROM THE ENGINE FIRE TO ENTER THE CABIN THROUGH THE CABIN HEAT VENTS.

4. Throttle – MAX POWER

THIS IS ONLY TO GET THE REST OF THE FUEL IN THE LINES OUT AS SOON AS POSSIBLE. MAKE SURE THAT WHEN PRACTICING THIS SCENARIO THAT YOU DO NOT OVERSPEED THE PROPELLER AND PULL THE THROTTLE BACK TO IDLE, ESPECIALLY BEFORE ENTERING AN EMERGENCY DESCENT.

5. Fuel Pump – OFF
6. Master Switch – ON
7. Emergency Windows/Canopy – OPEN AS REQUIRED

IF FIRE PERSISTS ONCE ENGINE IS SHUT DOWN, PROCEED WITH EMERGENCY DESCENT.

**Due to fire- Proceed with**

**Electrical Fire In-Flight**

1. Emergency Switch – ON
2. Master & Battery Switch – OFF
3. Cabin Heat – OFF
4. Landing Site – SELECT
5. Emergency Windows – OPEN AS REQUIRED
6. Front Canopy – UNLATCH AS REQUIRED
7. Fire Suppressant – USE AS NECESSARY

**Land as soon as possible**

**Rough Engine**

1. Airspeed – TRIMMED FOR BEST GLIDE

THE FOLLOWING ITEMS SHOULD BE DONE AS QUICKLY AND METHODICALLY AS POSSIBLE, BECAUSE THEY MIGHT PREVENT AN EMINENT ENGINE FAILURE.

2. Fuel Pump – ON

IF THERE IS AN ISSUE WITH THE PRIMARY FUEL PUMP, THIS WILL HOPEFULLY RETURN ENGINE OPERATION TO NORMAL.

3. Ignition – CHECK ON BOTH
4. Carburetor Heat – ON

IN A CASE OF CARB ICING YOU WILL NOW NOTICE RPMs WILL DROP EVEN MORE, ENGINE ROUGHNESS MIGHT TEMPORARILY INCREASE TOO. EVENTUALLY THINGS SHOULD RETURN TO NORMAL. WHILE OPERATING WITH LIMITED RPMs MAKE SURE TO AIM FOR BEST GLIDE SPEED, EVEN IF IT MEANS A TEMPORARY LOSS IN ALTITUDE.

5. Engine Instruments – CHECK

IF ANY INDICATORS SUCH AS OIL PRESSURE COME UP, GO TO THAT CHECKLIST IMMEDIATELY.

6. Mixture - SET FOR SMOOTH RUNNING

THIS MEANS TO ADJUST THE FUEL AIR MIXTURE UNTIL YOU GET A SMOOTH-RUNNING ENGINE. SO IDEALLY ENRICHEN THEN LEAN UNTIL YOU GET THE BEST RESULTS.

7. Fuel Selector – CHECK SWITCH TANKS
8. Throttle/Mixture - TRY VARIOUS SETTINGS

If rough engine continues, Land as soon as possible- Prepare for engine failure.
Fire / Smoke during Takeoff

**If takeoff can be abandoned:**
1. Throttle - IDLE
2. Fuel Selector - OFF
3. Cabin Heat - OFF
4. Brakes - APPLY
5. All Electrical Switches - OFF
6. Airplane - EVACUATE

**If takeoff cannot be abandoned:**
7. Takeoff – CONTINUE

After climbing to a location where an emergency landing may be executed:
8. Airspeed - TRIMMED FOR BEST GLIDE
9. Fuel Selector - OFF
10. Fuel Pump - OFF
11. Cabin Heat - OFF
12. All Electrical Switches - OFF
14. After Touchdown - EVACUATE

**Electrical Fire on the Ground**
1. Master Switch – OFF
2. Brakes - APPLY
3. Throttle – IDLE
4. Mixture – IDLE CUTOFF

**When the engine has stopped:**
5. Ignition Switch – OFF

**WARNING, IF THE MAGNETOS ARE NOT OFF, THE PROP MAY BE ABLE TO ROTATE WITH VERY LITTLE EFFORT- CREATING A HAZARD.**
6. Canopy – OPEN
7. Airplane – EVACUATE

**Engine/Carburetor Fire During Start**

**If Engine Starts:**
2. Throttle – SET 1800 RPM FOR 4 MINUTES

**IT MIGHT SEEM LIKE A LONG TIME, BUT THIS IS TO REMOVE THE THREAT OF EXPLOSION**
3. Cabin Heat – OFF
4. Brakes - APPLY

**If Engine does NOT Start:**
5. Mixture – LEAN
6. Throttle – FULL
7. Electric Fuel Pump – OFF
8. Fuel Selector – OFF
9. Master Switch – OFF

**When Engine has stopped:**
10. Ignition Switch – OFF
11. Canopy - OPEN
12. Airplane – EVACUATE

Have the Aircraft Inspected before returning to service.

**Loss of RPM**
1. Fuel Pump – ON
2. Carburetor Heat – ON
3. Fuel Selector – CHECK
4. Friction Lock - ADJUST

**BEST GLIDE SPEEDS**

<table>
<thead>
<tr>
<th>Aircraft weight (lbs.)</th>
<th>2535</th>
<th>2205</th>
<th>1874</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flaps UP</td>
<td>73</td>
<td>68</td>
<td>60</td>
</tr>
<tr>
<td>Flaps T/O</td>
<td>72</td>
<td>66</td>
<td>59</td>
</tr>
<tr>
<td>Flaps LDG</td>
<td>71</td>
<td>63</td>
<td>58</td>
</tr>
</tbody>
</table>
### Door Open Light (on the Ground or In-Flight)

1. **On the Ground** - FIND A SAFE SPOT TO SECURE THE DOOR
2. **In Flight**
   a. Airspeed - SLOW TO VA
   b. Front Canopy - CHECK LATCHED
   c. Rear Door - VISUALLY CHECK LATCHED

*WE HAVE HAD DOOR DEPART THE AIRCRAFT WHEN PILOTS HAVE TRIED TO FIX THEM IN FLIGHT. DO NOT ATTEMPT TO CLOSE IN FLIGHT.*

*Don’t touch rear door in flight!*

If rear door appears unlatched in flight- land ASAP at an appropriate airfield

### Alternator Failure

1. **Circuit Breakers** - CHECK

   | If no circuit breakers had popped: |
   | 2. Ammeter - CHECK |

   | If ammeter appears normal: |

   Continue to nearest practicable airport, monitor electrical system. Have mechanic fix problem.

   | If any circuit breakers have popped: |

   Allow cooling period and attempt to reset popped circuit breakers (only once.)

   | If a reset fails: |
   | 3. Essential Bus Switch - ON |
   | 4. Electrical Load - REDUCE TO MINIMUM |
   | 5. Voltage - CHECK REGULARLY |
   | 6. Electrical System - MONITOR |

Land at nearest suitable airport within 30 minutes

| If aircraft battery becomes depleted: |
| 7. Emergency Battery Switch – UNGUARD & ON |

### Low Volts In-Flight

1. **Master Switch** - LEAVE ON
2. **Unnecessary Electrical Equipment** - OFF
3. **Ammeter** - CHECK

If caution light does not extinguish and the ammeter reads zero:

*Proceed with ALTERNATOR FAILURE*

### Overvoltage

1. **Essential Bus** - ON
2. **Master Switch** - ALTERNATOR OFF
3. **Unnecessary Electrical Equipment** - OFF

Land at nearest airfield. Expect only 30 mins. of usable electric power.

### Low Volts on Ground

1. **Throttle** - SET 1200 RPM
2. **Master Switch** - LEAVE ON
3. **Electrical Equipment** - OFF
4. **Ammeter** - CHECK

If caution light does not extinguish and the ammeter reads zero:

| 5. Master Switch - RECYCLE ALTERNATOR |

*If light continues and ammeter reads zero - TERMINATE FLIGHT*

### Starter Engaged after start

1. **Throttle** - IDLE
2. **Mixture** - IDLE CUTOFF
3. **Ignition Switch** - OFF
4. **Master Switch** - OFF
Terminate flight - maintenance is necessary.

Defective Mixture Control
1. Altitude - MAINTAIN TO AIRPORT
2. Descent - TEST TO A HIGHER POWER SETTING

A lean mixture can lead to engine roughness and a loss of power.

CO Contamination
1. Test/Reset Button - PRESS

*If alert continues:*
2. Cabin Heat - OFF
3. Ventilation - OPEN
4. Emergency Windows - OPEN
5. Front Canopy – UNLATCH & SLOW <140 KIAS

Land as soon as practical

High Cylinder Head Temperature
1. Mixture - ENRICH
2. Oil Pressure - CHECK

*If oil pressure is low proceed with - LOW OIL PRESSURE*

*If oil pressure is normal:*
3. Throttle - REDUCE
4. Airspeed - INCREASE

High Fuel Flow
1. Fuel Pressure - CHECK

Low fuel pressure indicates a possible leak in the system

2. Fuel Quantity – MONITOR

*If TANK YOU ARE USING SEEMS TO DRAIN FAST, SWITCH TANKS.*
3. Power Setting - CHECK

Land as soon as practicable to avoid fuel exhaustion

Low Fuel Pressure
1. Fuel Pump - ON
2. Fuel Quantity - CHECK
3. Fuel Selector - CHECK
4. Mixture - ADJUST

Land as soon as practicable; prepare for engine failure

High Oil Temperature
1. Oil Pressure - CHECK

*If oil pressure is low proceed with - LOW OIL PRESSURE*

*If oil pressure is normal:*
2. Mixture - ENRICH
3. Throttle - REDUCE
4. Airspeed - INCREASE

Land as soon as practicable

Low Oil Pressure
1. Throttle - REDUCE
2. Oil Temperature - MONITOR
3. CHT - MONITOR

Land as soon as practicable; prepare for engine failure

Flight into Icing Conditions
1. Icing Area – LEAVE

*IT IS USUALLY BEST TO MAKE A 180 DEGREE TURN AT A SAFE AIRSPEED.*
<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Pitot Heat - ON</td>
</tr>
<tr>
<td>2.</td>
<td>Cabin Heat – ON &amp; DEFROST</td>
</tr>
<tr>
<td>3.</td>
<td>RPM - INCREASE</td>
</tr>
<tr>
<td>4.</td>
<td>Carburetor Heat - ON</td>
</tr>
<tr>
<td>5.</td>
<td>Emergency Windows - OPEN IF REQUIRED</td>
</tr>
</tbody>
</table>

If Pitot Heat fails, open alternate static valve and close emergency windows. **CAUTION:** Ice build-up increases stall speed. If ice does not melt before landing, a no-flap landing may be required.

### Spin Recovery

**The following steps are made immediately and simultaneously:**

1. Throttle - IDLE
2. Rudder - FULL DEFLECTION OPPOSITE OF SPIN
3. Elevator - FULLY FORWARD
4. Ailerons - NEUTRAL
5. Flaps - UP

**When rotation has stopped:**

6. Rudder - NEUTRAL
7. Elevator - PULL CAREFULLY
8. Descent - RECOVER INTO NORMAL FLIGHT

**WARNING:** Never allow the airplane’s speed to exceed \( V_{NE} \)

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EMERGENCY PROCEDURES CAN BE FOUND IN CHAPTER 3 OF THE AFM!

AT ANY TIME, THE PIC MAY REFERENCE THE AFM FOR ITEMS NOT INCLUDED ON THIS CHECKLIST
DA40-180 Differences

Three main differences from the FP to the -180.

1. Propeller Governor
2. Alternate Air
3. Auto Pilot

The Propeller for the DA40-180 could be one of three different makes. The propeller could be aluminum, wood composite, or fiberglass composite. The configuration could be a two or three bladed configuration. The limitations for the wood or composite blades are listed in the AFM. (7.9.3)

Propeller Governor

There are three options for propeller governors that could be installed: Woodward C-210776 Governor, MT P-420-10 Governor (OÄM 40-077) or MT P-860-23 Governor (OÄM 40-289).

The operation is fundamentally the same.

RPM Lever - Central lever with blue handle.

- Lever forward (HIGH RPM) = High RPM, fine pitch
- Lever to rear (LOW RPM) = Low RPM, coarse pitch

By means of this lever the propeller governor controls the propeller pitch and thus engine RPM (= propeller RPM). A selected RPM is held constant by the governor independent of the airspeed and the throttle setting (‘Constant Speed’).

The movement of the RPM lever adjusts pressure on a speeder spring that keeps the propeller at a specific speed. The fly weights control the oil that enters the propeller and keeps it at a specific speed. Hence the speed of the propeller is controlled by the blue lever.

Centrifugal force pulls on the fly weights, this moves the shuttle valve allowing for oil to enter or exit the oil in the propeller hub. When it is on speed, no oil moves, under-speed it moves it to a High RPM. Over-speed and it allows oil to leave changing to a Low RPM.

The propeller governor is flanged onto the front of the engine. It regulates the supply of engine oil to the propeller. The propeller governor oil circulation is an integral part of the engine oil circulation system. Following a defect in governor or oil system, the blades go the finest possible pitch (maximum RPM), thus allowing continuation of the flight.

CAUTION: Following failure of the governor or a serious drop in oil pressure, the RPM should be adjusted using the throttle. Every effort should be made not to exceed 2700 RPM.
CAUTION: The throttle and RPM lever should be moved slowly, in order to avoid over-speeding and excessively rapid RPM changes. The light wooden propeller blades produce more rapid RPM changes than metal blades.

**Alternate Air**

Alternate Air In the event of the loss of manifold pressure because of icing or blocking of the air filter, there is the possibility of drawing air from the engine compartment. The operating lever for alternate air is located under the instrument panel to the left of the center console. To open alternate air the lever is pulled to the rear. Normally, alternate air is closed, with the lever in the forward position.

**Autopilot**

The autopilot is an additional tool in the DA40-180’s. This tool is to be learned and utilized in training. But as with any tool it should not be relied upon solely. There are two models in USU’s fleet- the KAP-140 and the GFC-700. To count for the Technologically Advanced Airplane (TAA) you will need to use the GFC-700.

The autopilots are different, but the fundamentals are included below. Please read the associated manuals for the respective autopilots. The main idea is that the autopilot is a faithful dog. It will try and do what you ask it to, but it will not utilize logic to do it. Selecting the Autopilot doesn’t relieve you of the responsibility of flying the aircraft.

**Mode Specifics:**

**KAP-140**
- Auto Pilot (AP)- engaged or disengaged
- Heading (HDG)- fly the heading bug on the G1000
- Navigation (NAV)- Fly the navigation that is active on the CDI meant for enroute navigation.
- Approach (APR)- Fly the approach mode with lower tolerance/deviation.
- Reverse Sensing (REV)- used to fly a Back-Course approach
- Altitude Hold (ALT)- Used to select how to get to an altitude
  - UP- nose up or altitude selected up
  - DN- Nose down or altitude selected down

**GFC-700**
- Auto Pilot (AP)- engaged or disengaged
- Flight Director (FD)- engage the Flight director can be used without the autopilot being engaged.
- Heading (HDG)- fly the heading bug on the G1000
- Navigation (NAV)- Fly the navigation that is active on the CDI meant for enroute navigation.
- Approach (APR)- Fly the approach mode with lower tolerance/deviation.
- Altitude Hold (ALT)- used to hold an altitude
- Vertical Speed (VS)- used to set a vertical speed to climb or descent with.
  - Nose UP- used to adjust vertical speed or airspeed
  - Nose DN- used to adjust vertical speed or airspeed
- Flight Level Change (FLC)- Uses a specific airspeed to climb to a preselected altitude.

**Additional Autopilot Interfaces:**

**Control Wheel Steering (CWS) Button:**
- While pressed, allows manual control of the aircraft while the autopilot is engaged.
- Upon release of the CWS Button, the flight director may establish new reference points, depending on the current pitch and roll modes.
- The CWS Button is located on the top of the pilot’s control stick grip.
Go-Around Switch (DA40-180 XLS ONLY):

- Disengages the autopilot and selects flight director Go Around Mode.
- This switch also activates the missed approach when the selected navigation source is GPS or when the navigation source is VOR/LOC and a valid frequency has been tuned.
- The GA Switch is located on the left-side of the throttle.

The GFC 700 will fly the published missed approach holding pattern as depicted. The KAP 140 will also do the same, but must be monitored.

### Autopilot Malfunctions:

Both the KAP 140 and GFC 700 have required immediate action items published in the AFM/PIM for Autopilot or Electric Trim Malfunction/Failure.

These are the very similar for both autopilots and should be committed to memory—just as other emergency action items.

1. Control Stick – GRASP FIRMLY (regain control of airplane)
2. A/P TRIM DISC Button – PRESS and HOLD (throughout recovery)
3. Elevator Trim Controls – ADJUST MANUALLY (as necessary)
4. AUTO PILOT Circuit Breaker – OPEN (pull out)
5. A/P TRIM DISC Button - RELEASE

**WARNING:** FOLLOWING AN AUTOPILOT, AUTOTRIM OR MANUAL ELECTRIC TRIM SYSTEM MALFUNCTION, DO NOT ENGAGE THE AUTOPILOT UNTIL THE CAUSE OF THE MALFUNCTION HAS BEEN CORRECTED