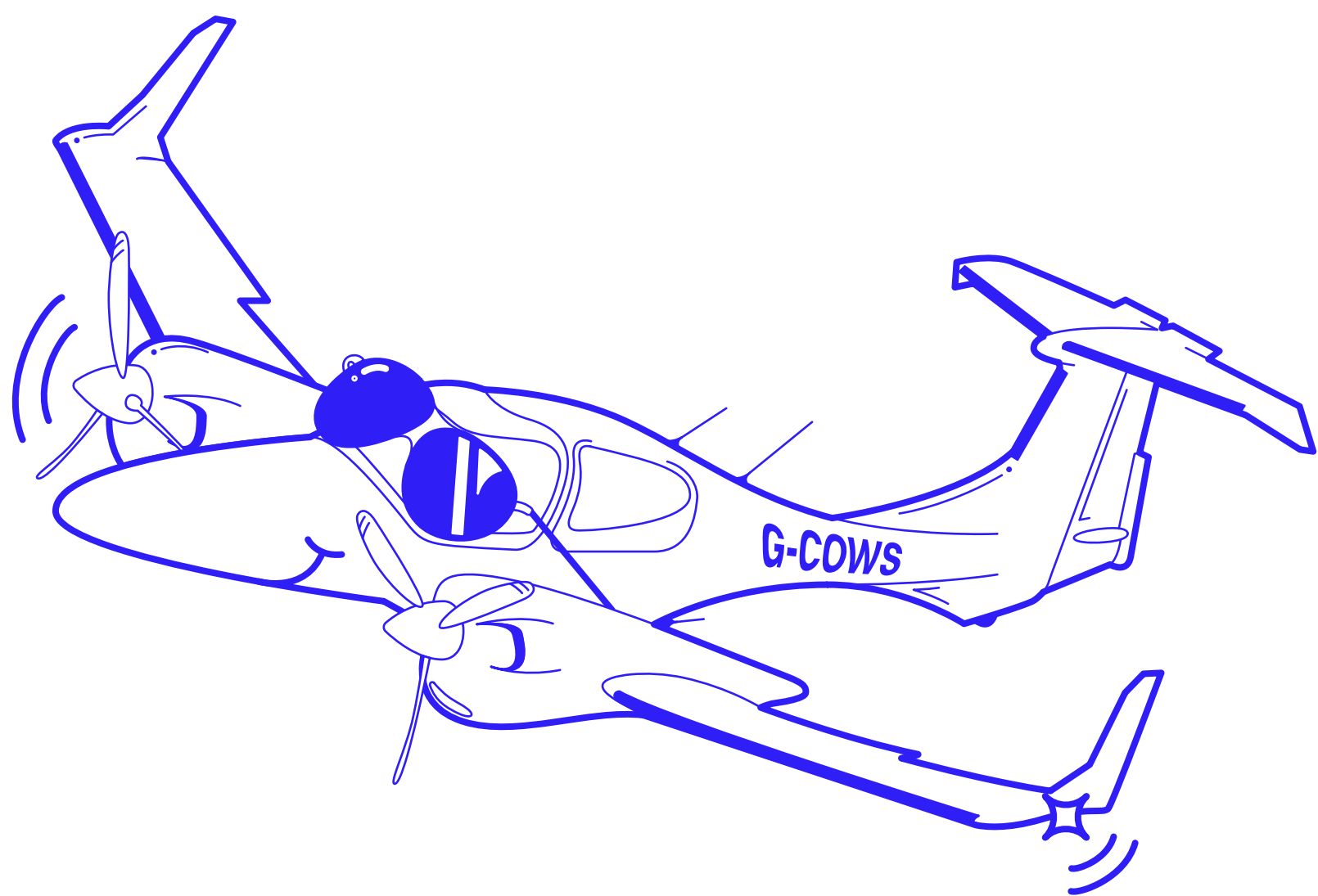


Pilot's Operating Handbook



DA42 Series

COWS	UPDATED: 16/05/2024	
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	MADE WITH LOVE AND PASSION	
Creator of Worlds - COWS Bespoke Aircraft for Microsoft Flight Simulator & X-Plane From Australia Austria United Kingdom United States	DA42 Series for MSFS Includes DA42-VI & -TDI For Version: 1.1.0+	YouTube Instagram cows.studio

Introduction

Welcome to the pasture! Isn't this exciting?

*These moments are the reason we're here
—the excitement of beginning and the
thrill of discovering something new.*

Thank you for being a part of our story.

*Your new DA42 has been designed
meticulously inside and out to be the most
accurate replica of the real DA42. We
curated this product around our mission of
helping flight students with their multi-
engine training.*

*We desire that you will find flying it, either
for training or leisure, a pleasant and
valuable experience.*

*Use #COWSFS on Instagram for a chance
to be featured:*

COWS INSTAGRAM

*Or join us here, where your voice is
valued, and your creativity is celebrated:*

DISCORD COMMUNITY

This COWS manual has been prepared as a guide to help you get the most out of your airplane. It contains instructions, features, and tips on operating the airplane within the simulator. This manual will reference and link Diamond's Official DA42 Operating Manuals to ensure proper procedures.

If you have any questions, requests, or suggestions, please reach out to us via our most active discussion platform: <https://discord.gg/GRRmWfjqr2>

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Toggling Features

This section contains information on the operation of failures, aircraft state-saving, and engine-damage features of the DA42.

Failures

The COWS DA42 has over 190 custom failures that are saved between flights. There are 4 modes for controlling failures:

- **Off**
- **Normal** (5% Chance of an item failing per hour)
- **High** (100% Chance of an item failing per hour)
- **Chaos** (1 failure per 30 seconds, above 35 knots)

To enable and select failure settings:

1. Navigate to the Engine Indicating System page (EIS)
2. Click on the “Menu” button on the right side of the MFD
3. Use the outer FMS knob on the bottom right corner of the MFD to scroll and select “Failures Mode”
4. Press the “Ent” button to enable failure mode
5. When done correctly, the menu should disappear and the system will cycle through the failure modes from Off -> Normal -> High -> Chaos
6. Repeat steps 2-4 until the desired mode is indicated on the menu page

Reset Menu



The reset menu allows you to reset specific parts of the aircraft.

- **Damage:** Reset damage related failures (incl. engines)
- **Failures:** Resets all random failures
- **Battery:** Recharges the batteries
- **ECU:** Removes any ECU failures. (Doesn't fix the problem, only the resulting failure message)
- **Everything:** All of the above

Engine Damage

The COWS DA42 has a custom engine damage model that will progressively deprecate engine performance when the powerplant is operated improperly.

To enable Engine Damage:

1. Navigate to the Engine Indicating System page (EIS)
2. Click on the “Menu” button on the right side of the MFD
3. Use the outer FMS knob on the bottom right corner of the MFD to scroll and select “ Reset Engine Damage” using the “ENT” button

User errors that will inflict damage:

- Sustained high LOAD >92% (VI)
- Fuel starvation
- Negative Gs
- Improper warmup
- Improper cooldown
- Overheating
- Unfiltered dirty air

State-Saving

The COWS DA42 has custom state-saving capabilities to restore the airplane to its prior configuration. The aircraft will **not** restore its previous configuration when spawning directly **on the runway** or **in mid air**.

Items that are not saved:

- Canopy & window positions
- Parking position
- Electric and engine masters

To enable and disable State-Saving:

1. Navigate to the Engine Indicating System page (EIS).
2. Click on the “Menu” button on the right side of the MFD.
3. Select “State Saving” and toggle using the “ENT” key.

Parking brake

The COWS DA42 has the ability to simulate a parking brake valve. The valve will hold the pressure inputted by the user.

To enable and disable Realistic parking brake:

1. Navigate to the Engine Indicating System page (EIS).
2. Click on the “Menu” button on the right side of the MFD.
3. Select “Realistic parking brake” and toggle using the “ENT” key.



Engine Control

This section contains information on the operation of the DA42 Series powerplant

FADEC

The DA42TDI and DA42VI come equipped with Full Authority Digital Engine Controlled engines (FADEC). These are also referenced as ECUs. There are 2 ECUs per engine (A/B) for redundancy. The ECUs adjust manifold pressure and injected fuel quantity automatically based on density altitude. With this, the pilot workload is reduced and safety is increased.

At high altitudes and or high temperatures, the engine may not be able to provide the target Load. The pilot must confirm good Load before departure by setting max power and comparing the Load display to the tables shown below.

Tip: Check the table before taxiing out to avoid scrambling for it later.

DA42-VI

Minimum Load

	OAT								
Altitude [ft]	-35°C -31°F	-20°C -4°F	-10°C 14°F	0°C 32°F	10°C 50°F	20°C 68°F	30°C 86°F	40°C 104°F	50°C 122°F
0	99%					97%	96%	93%	91%
2000	99%					97%	96%	93%	
4000	99%					97%	96%	93%	
6000	99%					97%	96%	93%	
8000	99%		98%	98%	98%	96%	95%	92%	
10000	98%	97%	97%	95%	94%	92%	89%		

DA42-TDI

Minimum Load

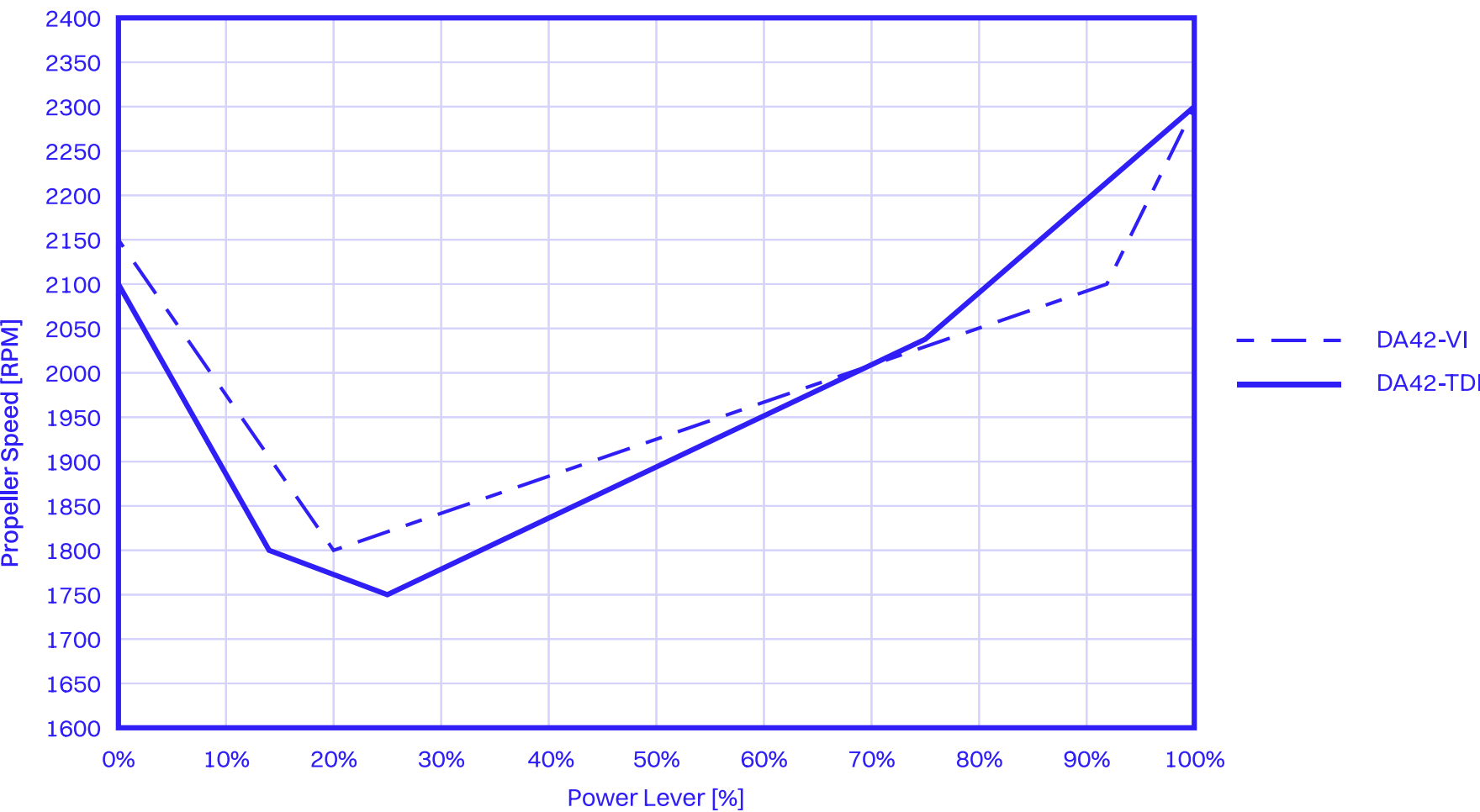
	OAT								
Altitude [ft]	-35°C -31°F	-20°C -4°F	-10°C 14°F	0°C 32°F	10°C 50°F	20°C 68°F	30°C 86°F	40°C 104°F	50°C 122°F
0	98%					96%	93%	91%	88%
2000	98%					96%	93%	90%	
4000	98%					94%	90%	86%	
6000	98%			95%	90%	97%	96%	93%	
8000	98%		93%	90%	86%	83%	80%	77%	
10000	98%	92%	89%	85%	82%	80%	76%		

FADEC [cont.]

Propeller RPM is also set by the Power lever. The target RPM follows the Curves shown below. Typically the maximum RPM is reduced slightly to avoid constant overspeed warnings.

Tip: Do not reduce the power too quickly during your landing flare. The large increase in drag will cause the wings to lose lift and drop fast.

The area below 20-25% is called “disc mode”. The reduction in power and increase in RPM causes a large increase in drag. This can be used to bleed off speed or descend quickly



Power Lever %	DA42-VI Values:
0	2150
20	1800
92	2100
100	2300

Power Lever %	DA42-TDI Values:
0	2100
15	1800
25	1750
75	2030
100	2300

ECU Test

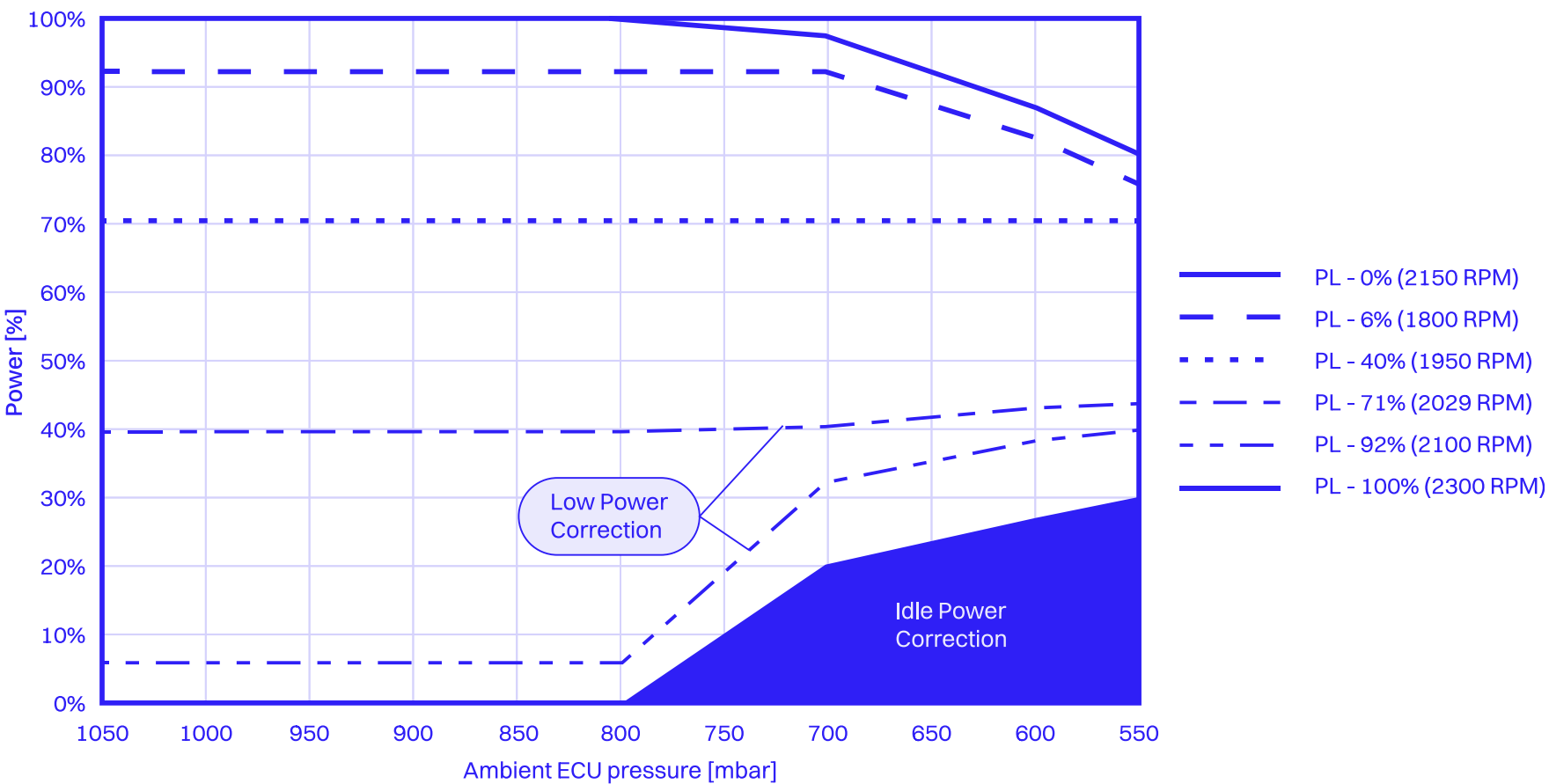
Just like on any aircraft, a before departure check must be performed (run-up). As the pilot does not have manual control of the systems the run-up is done automatically by the ECUs. This is done by pressing and holding the corresponding ECU test button on the left side of the instrument panel.

To start the ECU test, certain criteria need to be met:

- Power levers idle
- ECU voters set to auto
- Propeller below 1100 rpm
- Weight on wheels
- No errors
- Gearbox temperature above 35° (VI only)

The engine rpm will increase, the propeller will be cycled back and forth, and come back down to idle once per ECU. Hold the button down until all CAS messages are gone and the engine has rested at idle. The test takes around 20-25s.

Engine Performance depending on Ambient ECU Pressure and Power Level (PL) Position



Note on the VI:

At high-altitude airports, the DA42VI will run at a higher idle setting to prevent Combustion extinction (flame out). Take this into account when landing at high altitude airfields. This may increase the RPM above the threshold mentioned above.

Manual ECU test procedure:

- Set Voter switch to A. Confirm smooth running engine.
- Set MAX power, Confirm good and stable LOAD/RPM. No ECU warnings
- Set IDLE power
- Repeat for ECU B and other engine.

ECU Error Handling

If an ECU detects any anomalies it will display an “ECU FAIL” CAS message and automatically switch over to the other ECU. The “FAIL” message does not mean the ECU has failed. The message simply shows that something isn't perfect and the engine may still run perfectly fine.

There are 2 types of failures. Category “Low” (unlatched) and category “High” (Latched) errors. An unlatched error can be reset while a latched error cannot.

Types of ECU Errors:

- **Unlatched:** An unlatched error can occur if a parameter shortly exceeds a threshold (eg: boost pressure).
- **Latched:** A latched error can occur if a sensor fails (eg: Boost sensor failure).

Note: The TDI and VI variants may categorise the same failure differently.

What to do if you encounter an ECU failure:

- Ensure the Aircraft is in a safe attitude, airspeed and area. Temporary engine failure may occur
- Troubleshoot the initial cause of the error. (filter icing, fuel pressure, power change)
- VI: Voter switch to the failed ECU.
 - If the error clears, return voter switch to auto and continue flight.
 - If the error persists, return voter switch to auto and land at the next suitable airfield.
- TDI: Hold the ECU test button for 5 seconds.
 - If the error clears, continue the flight.
 - If the error returns or persists, land at the next suitable airfield.

Do not pull ECU circuit breakers: Power loss is a category “High” failure and engine failure may occur if the wrong circuit breaker is pulled by accident.

Detailed steps and troubleshooting can be found in the Aircraft's flight manual.

Clickspots & Accessibility

This section contains information on the operation of clickspots, tips, and operable features of the COWS DA42.

Dual ECU Test button

During the routine ECU test, pilots usually use both their fingers to hold the ECU buttons together. This can be using the click spot located **between the two ECU test buttons**. As mentioned previously, this is also used to **reset failures** incase of a **PFD** or **MFD** failure

Windows & Doors

The COWS DA42 has various operable doors throughout the model:

- The left front red handle within the cockpit operates the front canopy
- The left rear red handle within the cockpit operates the rear door
- The left & right storm window notch operate their respective window

The COWS DA42 has the following inoperable doors:

- The FWD baggage doors
- The gearbox oil access panel
- The fuel cap

Control Sensitivities

The COWS DA42 flight model reacts appropriately across various control sensitivity settings. However, it is recommended that the user has flight control peripherals tuned to the right sensitivity options in the simulator

We recommend only adjusting one setting, **REACTIVITY**:

- Less than or equal to 30% across all control surfaces

Headset Simulation

The COWS DA42 has implemented and referenced real sound recordings from the Bose A20 to mimic its ANC (Active Noise Cancellation) feature.

To enable headset simulation, locate the GA plug jacks found on the rearward side of the middle console. The click spot is the jack itself.

Ignition Key

The COWS DA42 has implemented a large area ignition key rotation click spot for ease of use.

At times, the key may be hard to turn in one direction or the other. To ease rotation, move the camera towards the desired side of rotation and click-hold the key.

Flood Light

The COWS DA42 has implemented an easier click spot for the cabin lights.

The click spot is located on the **standby airspeed indicator needle**. The pilot's floodlight is connected directly to the main battery and will function even when the electric master is off.

Pilot & Copilot visibility

The COWS DA42 has the ability to toggle through 3 modes of pilots visibility. These can be toggled by clicking the seat belt buckles

- 1. Normal:** The pilots are only visible externally with a weight over 10lbs set
- 2. On:** The pilots are always visible
- 3. Off:** The pilots are not visible

Important Speeds & Operating Limitations

This section contains information on critical airspeeds and limits of the DA42.

DA42-VI

VSPEEDS

It's important to note specific airspeeds for takeoff, landing, cruise, and stall conditions.

DA42-VI (Section 2 & Section 5 of AFM):

- Vr - Takeoff Rotation Speed:

76 KIAS
- Vyse - Single Engine Climb Speed:

85 KIAS
- Vy - Best Rate of Climb:

92 vKIAS
- Vref - Approach Speed:

84 KIAS
- Vo - Maneuvering Speed:

112-122 KIAS

	Airspeed		KIAS	Remarks
VO	Operating manoeuvring speed	Above 1800 kg (3968 lb)	122 KIAS	Do not make full or abrupt control surface movement above this speed.
		Above 1700 kg (3748 lb) to 1800 kg (3968 lb)	119 KIAS	
		Up to 1700 kg (3748 lb)	112 KIAS	
VFE	Max. flaps extended speed	LDG	113 KIAS	Do not exceed these speeds with the given flap setting.
		APP	133 KIAS	
VLO	Max. landing gear operating speed	Extension VOE	188 KIAS	Do not operate the landing gear above this speed.
		Retraction VOR	152 KIAS	
VLE	Max. landing gear extended speed		188 KIAS	Do not exceed this speed with the landing gear extended.
VMCA	Minimum control speed airborne	APP	68 KIAS	With one engine inoperative, keep airspeed above this limit.
		UP	71 KIAS	
VNO	Max. structural cruising speed		151 KIAS	Do not exceed this speed except in smooth air, and then only with caution.
VNE	Never exceed speed in smooth air		188 KIAS	Do not exceed this speed in any operation.

DA42-TDI

VSPEEDS

It's important to note specific airspeeds for takeoff, landing, cruise, and stall conditions.

DA42-TDI (Section 2 & Section 5 of AFM):

- Vr - Takeoff Rotation Speed:

72 KIAS
- Vyse - Single Engine Climb Speed:

82 KIAS
- Vy - Best Rate of Climb:

86 KIAS
- Vref - Approach Speed:

78 KIAS
- Vo - Maneuvering Speed:

120-126 KIAS

	Airspeed		KIAS	Remarks
VA	Manoeuvring speed if MÄM 42-088 or OÄM 42-054 or both incorporated	Above 1542 kg (3400 lb)	126 KIAS	Do not make full or abrupt control surface movement above this speed.
		Up to 1542 kg (3400 lb)	120 KIAS	
	Neither MÄM 42-088 or OÄM 42-054 incorporated	Above 1468 kg (3236 lb)	124 KIAS	
		Up to 1700 kg (3748 lb)	121 KIAS	
VFE	Max. flaps extended speed	LDG	111 KIAS	Do not exceed these speeds with the given flap setting.
		APP	137 KIAS	
VLO	Max. landing gear operating speed	Extension VLOE	194 KIAS	Do not operate the landing gear above this speed.
		Retraction VLOR	156 KIAS	
VLE	Max. landing gear extended speed		194 KIAS	Do not exceed this speed with the landing gear extended.
VMCA	Minimum control speed airborne		68 KIAS	With one engine inoperative, keep airspeed above this limit.

Flight Planning Tips

This section outlines tips and tricks to make a flight plan and calculate critical distances, time, and speeds for a general aviation flight. Below are techniques derived from real-world flying.

For a more detailed outline, take a look at Mitchell’s flight instructor lesson plan here: [Download](#)

Planning a Flight

To plan a cross-country flight, using tools such as Skyvector, Foreflight, or Garmin Pilot will help aid your flight planning process. Begin by first plotting the departure and arrival airport. Then find waypoints in between, whether VFR or IFR, use visual waypoints on the map, or use VORs and NAVAIDs. Waypoints should be within 20nm to ensure navigational signal integrity and basic pilotage.

After establishing waypoints, pick an altitude of over 2000ft AGL over the highest terrain or obstacle en route, then add 500ft if VFR. This will be your cruising altitude.

Top of Climb

To calculate top of climb, refer to the operating manual cruise climb performance chart to calculate rate-of-climb at your given weight. Then average that climb rate with the departure altitude and the cruising altitude. Then, divide the altitude difference (cruise altitude - departure field altitude) by the climb-rate. This will give you the resulting minutes it takes to reach top of climb.

To calculate the distance, you will need to multiply your ground speed by the time it takes to reach top of climb (in hours). To calculate groundspeed, take indicated airspeed, convert it to calibrated airspeed in AFM, then use local winds aloft to add or subtract from the calibrated airspeed.

Finally, divide the resulting calculated minutes above by 60 to convert it to hours, and multiply that by the groundspeed to determine how far out your TOC will be in NM.

Top of Descent

To calculate the top of descent, multiply the altitude difference (Cruise altitude - arrival field altitude) by 3. Move the decimal 3 places to the left and this will be the NM out that you will need to start your descent.

To calculate how fast you should descend, take your groundspeed and divide it by two, add a 0 to the end and the result is your standard FPM descent rate on a 3-degree standard glideslope

Refer to this worksheet developed for Utah State University for formulas to calculate Top of Climb (TOC) & Top of Descent (TOD) Calculations: [LINK](#)

Product Information & Useful Links

This section provides users with links to useful documentation from official Diamond training checklists, to the paint kit for the aircraft if you want to get creative.

Product Features

Systems • Accurate electrical system with circuit breakers and custom alternator voltage simulation • Custom standby flight instrumentation • Deice system with weight and functional stall heat • Custom gear hydraulic system simulation with state saving and gravity emergency extension • Custom lighting that warms up and responds to system voltage • Custom Yaw damper and multiple fixes to native Asobo systems • Engine damage, state saving, and random failures (to come later)	Visual Model • Light-baked photorealistic reflections and ray-traced shadows & lighting textures • Faithful exterior model matched with hundreds of pictures at various angles • Intricate Interior model featuring moderate and heavy wear • Interior features two options of black panel/standard grey furnishings • Subtle and photorealistic photo-overlays for incredible lifelike textures • All placards sourced and positioned from Diamond maintenance manuals • Exterior features realistic moderate to heavy dirt/wear, matching reference DA42 • Fibreglass scratching • TKS leaks • Physics-based wing flex	Engine Model • Accurate performance, efficiency and behaviors. Custom turbo, intercooler, filter icing, alternate air simulation, alternator parasitic drag, including shakes and vibrations caused by non normal operations and damage. • Individual piston compression, blow by, crankcase pressure and combustion simulation for startup • Custom propeller feathering physics and de-feathering accumulator • FADEC with dual ECUs, automated ECU test, error detection, automatic switching, glow plugs, runtime saving and high altitude flameout prevention • Custom water/oil/gearbox/fuel temperature simulation with thermostats, water pumps, heat soak and hysteresis • Custom oil pressure simulation with bypass valve, priming and starvation. • Custom Fuel pressure simulation with priming and starvation.
Sounds • Developed from the creator of sounds for FBW A32NX, FlightFX vision jet and other projects. • Sound simulation follows systems, e.g. hydraulic actuator • Dynamic engine, wind, and ground roll sounds • Engine sounds differ depending on prop pitch, fuel flow, and speed • Dynamic wind sounds, howling sounds in slips and drag noises with gear and flaps • Sounds sourced from first-party sources, local DA42 • Headset simulation	Flight Model • Accurate Performance and handling with over 1500hrs of testing from DA42 pilots, students, and instructors • Custom flight control animations showing respective trim forces and variable elevator backstop • Tiny bump when dropping the gear and deceleration on touchdown • Airframe shake during ground power runs	Other • Slight differences of the engine parameters (temps, pressures, rpms) • Slow and delayed engine indications • props come off the start lock when master is turned on • Feathering and windmilling • Brake fade

Paintkit

Get creative by turning your DA42 into a virtual canvas with creating custom liveries and paints through our official paint kit for the COWS DA42:

[**DOWNLOAD**](#)

Normal & Emergency Checklists:

The official Diamond training checklists is recommended to be used with the COWS DA42:

[**DOWNLOAD**](#)

END OF DOCUMENT

