Flight Training Division

Handout
DA42 NG
Familiarisation

Diamond DA42 **NG**
Familiarisation

DA42 NG Familiarisation

- Power Plant
- Instrument Panel
- Mass and Speeds
- Fuel System
- Flight Controls
- Electrical System
- Performance
- Mass and Balance
- Servicing
- Flight Procedures

Diamond DA42 NG

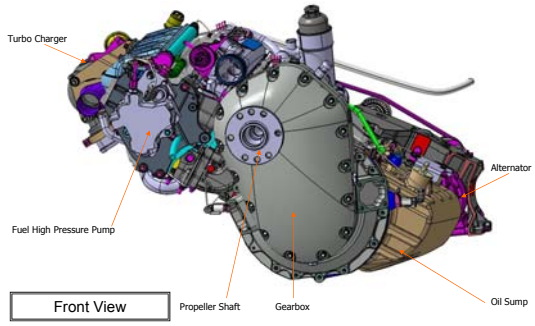
Power Plant

Power plant

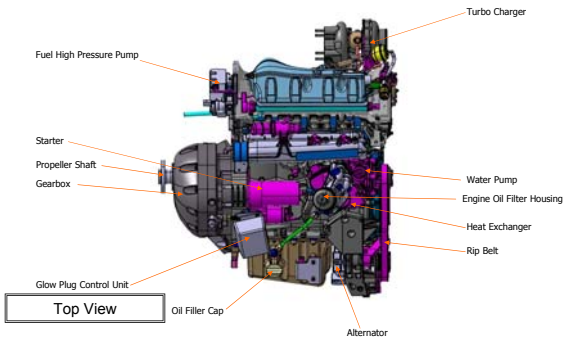
- 2 Austro Engines E4-B
- Four cylinders, liquid-cooled
  - 1991 ccm
- Common-rail direct injection
- Reduction gear 1:1,69
- Dual digital engine control
- Turbocharger
- Torsion vibration damper isolates engine from propeller
- Max. power: **100%** (5 minutes time limit)
  123,5 kW (165,6 DIN-HP) at 2300 RPM
- Max cont. power: **92%**
  113,6 kW (152,3 DIN-HP) at 2100 RPM

Austro Engine E4-B

Austro Engine E4-B



Austro Engine E4-B



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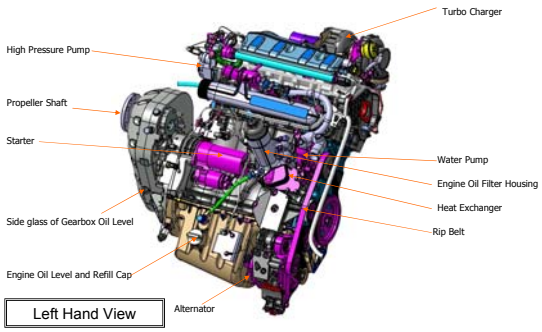
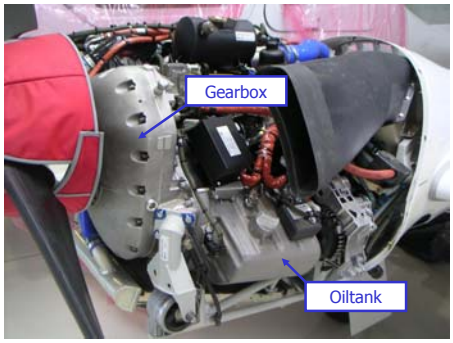


Austro Engine E4-B



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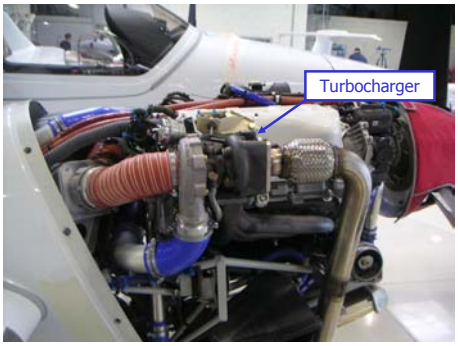

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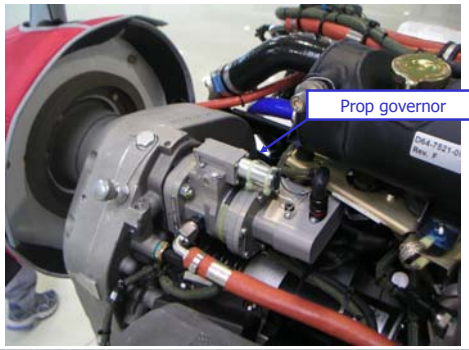


Engine Control Unit

- ECU swap switches are now named:
- „VOTER switches"
- Normally in AUTO position
- Working ECU is automatically selected according operating hours or in case of malfunction

ECU test buttons

Test on ground (PWR lever idle)

No reset function!

ECU test

BEFORE TAKE OFF CHECK

16	Power levers (2) ..... IDLE	16
17	ECU test (2)..... PERFORMED	17

ECU TEST

ECU test buttons (2)..... press and hold
"L/R ECU A/B fail"..... ON
Props cycling
"L/R ECU A/B fail"..... OFF
ECU test button..... release

18	VOTER switches (2) ..... A, AUTO, B, AUTO	18

Engines checked

ECU Abnormal checklist

L/R ECU A OR B FAIL **ON GROUND**

- Discontinue operation, terminate flight preparation

L/R ECU A FAIL **DURING FLIGHT**

Remark: in case of ECU A fail the system automatically switches to ECU B

- Verify VOTER switch in position AUTO
  - If ECU caution remains:
    - ⇒ Land ASAP
  - If additional engine problems are observed:
    - Go to Emergency Checklist page 6 ENGINE TROUBLESHOOTING

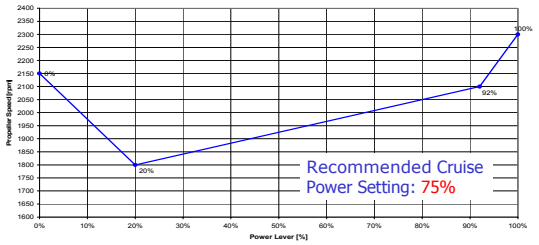
L/R ECU B FAIL **DURING FLIGHT**

Remark: in case of ECU B fail the system automatically switches to ECU A

- Verify VOTER switch in position AUTO
  - If ECU caution remains:
    - ⇒ Land ASAP
  - If additional engine problems are observed:
    - Go to Emergency Checklist page 6 ENGINE TROUBLESHOOTING

Power plant

- Power lever selects „LOAD" in %
- RPM automatically determined by selected power



Propeller

- 3-blade wooden propeller
- Constant speed, feathering
- Prop pitch set by ECU via an electro-mechanical actuator on the governor
- Governor operated by gearbox oil
  - Oil pressure up = pitch down = RPM up
  - Oil pressure down = pitch up = RPM down

Feathering system

- No „Auto-feather"
- Feathering by „Engine Master OFF" if RPM above 1300
- If RPM below 1300: prop pitch remains above high pitch lock
- Unfeathering by oil pressure from accumulator when Engine Master is ON

Fuel pumps

- 1 engine driven pump
- this high pressure pump feeds the common rail
- (an additional electrical fuel pump is part of the fuel system)

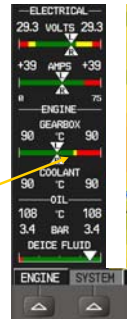
Power plant limitations

- Max overspeed: 2500 RPM, max 20 sec.
- Oil pressure:
  - < 1500 RPM: min 1,5 bar
  - >= 1500 RPM: min 2,5 bar
  - Max: 6,5 bar
  - Normal: 2,5 – 6 bar
- Oil quantity (per engine): 5.0 – 7.0 liters
  - Max. oil consumption: 0.1 liters/hr
- Oil temperature: -30°C – 140 °C
  - Normal: 50°C – 130°C

Power plant limitations

- Gearbox temperature:
  - Min: -30°C
  - Min at full load: 35°C
  - Max: 120 °C

The yellow cautionary range is for information only. There is no time limit associated with the cautionary temperature range.



Power plant limitations

- Coolant temperature:
  - min -30°C for start up
  - min 60°C full load
  - max 105 °C
- Fuel temperature:
  - min -25°C, max 60°C
- Fuel pressure:
  - min 4 bar, max 7 bar
    - no indication on G1000, but warning if below limit

Power plant limitations

AFM 3.7.4:
UNFEATHERING & RESTARTING THE ENGINE IN FLIGHT
If the reason for the shutdown has been ascertained and there is no indication of malfunction or engine fire a restart may be attempted.

- Max. restart altitude:
  - 18.000 ft for immediate restart
  - 10.000 ft for restart within 2 minutes
- No restart attempt if shut down for more than 2 minutes!
- Restart airspeeds:
  - starter assisted restart:
    - Max 100 KIAS or stationary prop, whichever is lower
  - Windmiling restart:
    - 125 – 145 KIAS

Power plant limitations

- No intentional shutdown below 3000ft AGL or above 10.000ft PA
- Intentional negative-g manoeuvers are not permitted

Starter limitations

- Operation: max 10 seconds
- 60 seconds cool down time

Power plant fluid specifications

- Fuel: JET A-1 or JET A (ASTM 1655)
  Minimum cetane number of 37 (EN ISA 5165/ASTM D613) recommended
- Oil: SHELL Helix Ultra 5W30
  SHELL Helix Ultra 5W40
- Gearbox oil: Shell Spirax GSX 75W-80
- Coolant: Destilled water + cooler protection 1:1 (BASF Glysantin Alu Protect Plus/G48) (freezing point –38 °C)

Engine operation

CHECK AFTER ENGINE START

3 Warm up time ..... START 3

Warm up:
Idle.....2 minutes
50% LOAD .....until Oil > 50°C and Coolant > 60°C

BEFORE TAKE OFF CHECK after line-up

Available power check (see pg.10)..... PERFORMED

Available Power Check:
10 sec. power MAX, RPM 2250 – 2300, min. load acc. table below

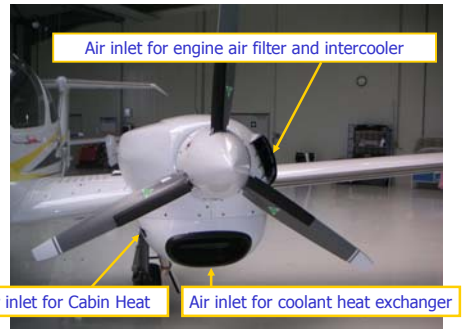
	OAT								
Altitude [ft]	-35°C	-20°C	-10°C	0°C	10°C	20°C	30°C	40°C	50°C
0						97%	96%	93%	91%
2000						97%	96%	93%	-----
4000			99%			97%	96%	93%	-----
6000						97%	96%	93%	-----
8000			98%	98%	98%	96%	95%	92%	-----
10000	98%	97%	97%	95%	94%	82%	89%	-----	-----

Engine operation

PARKING CHECK

1	Parking brake.....SET	1
2	Power levers (2) ..... max. 10% for 1 min.	2
3	ELT.....121,5 CHECKED	3
4	Engine / System page.....CHECKED	4
5	Engine / Fuel page ..... TTL TIME IN SVC NOTED	5
6	Avionic master.....OFF	6
7	Electrical consumers except ACL (strobe) .....OFF	7
8	Engine Masters (2).....OFF	8
9	ACL (strobe) .....OFF	9
	When engine indications x-ed out red:	
10	Electric Master.....OFF	10

Air inlets



Air inlets

Air outlet

Alternate air


Alternate air lever


Alternate air valve

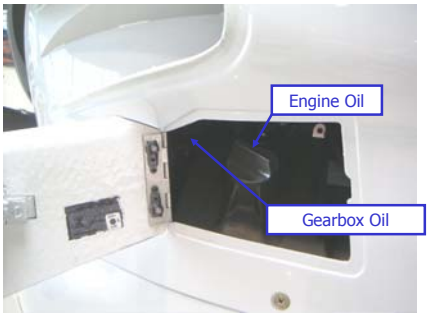
Alternate air


Alternate air lever pulled

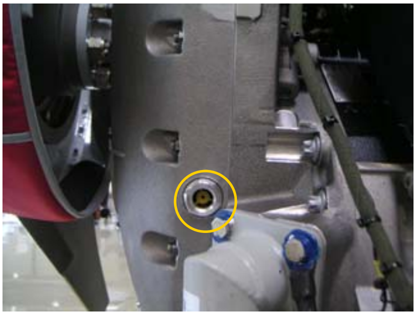

Alternate air valve open

Checking oil levels

Checking oil levels



Checking oil levels



Checking oil levels

Checking oil levels

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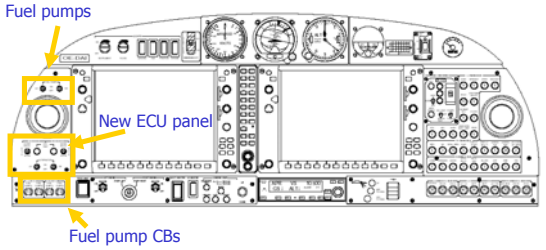
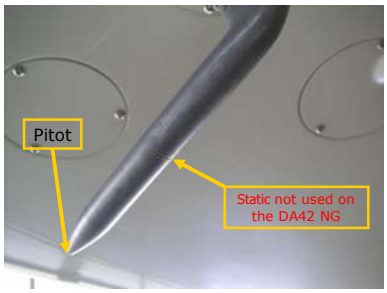
Instrument panel

Instrument panel („Upgrade NG" with KAP140)



Instrument panel („Upgrade NG" with KAP140)

Pitot probe



Static ports

Static ports

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Diamond DA42 NG

Mass and Speeds

Mass

Mass (Weight)

Empty (typical)	1450 kg
Max TKOF	**1900** kg
Max Ramp	+ 8 kg
Max Zero Fuel	1765 kg
Max LDG	1805 kg
Min for flight	1510 kg

!

Max Landing Mass

- Landing with a mass higher than 1805 kg is an „Abnormal Operating Procedure"
  - **However:**
- „Hard LDG Check" only required after a hard LDG, regardless of LDG mass

Speeds

Characteristic speeds

V_{NO}	151 KIAS
V_{NE}	188 KIAS
V_O	112 KIAS
	1700 kg
	119 KIAS
	1800 kg
	122 KIAS

Characteristic speeds

V_{SO}	62 KIAS
V_{S1}	69 KIAS
V_{MCA}	76 KIAS
Vops ice	118 - 156

Characteristic speeds

V_R	80 KIAS
V_X	---
V_Y	90 KIAS
V_{YSE}	85 KIAS
Vyse „ice"	88 KIAS
$V_{CRZ\ CLB}$	90 KIAS

Characteristic speeds

V_{FE} (Flaps APP)	133 KIAS
V_{FE} (Flaps LDG)	113 KIAS
$V_{LO\ E}$ (= V_{NE})	188 KIAS
Emergency extension	**152 KIAS**
$V_{LO\ R}$ (=~V_{NO})	152 KIAS
V_{LE} (= V_{NE})	188 KIAS

Characteristic speeds

Approach Speeds

$V_{REF\ FLAPS\ UP}$	86 KIAS
$V_{REF\ FLAPS\ APP}$	84 KIAS
$V_{REF\ FLAPS\ LDG}$	84 KIAS
$V_{GA\ FLAPS\ UP}$	90 KIAS

With ice protection system

Airspeeds with ice on unprotected areas

Continuous operation in icing conditions (except TKOF, LDG and maneuvers)	118 – 156 KIAS
Minimum continuous climb speed in icing conditions (flaps UP)	118 KIAS
Stalling speeds	+ 4-6 KIAS

App/Ldg Vref in icing conditions, 2-eng or 1-eng	
Flaps UP	94 KIAS
Flaps APP	90 KIAS
Flaps LDG	prohibited

With ice protection system

- Flaps LDG prohibited:
  - in icing conditions (ice on unprotected surfaces)
  - with residual ice
- Intentional 1-eng operation under known or forecast icing conditions is prohibited

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Fuel System

Fuel system

- For each engine: 2 parallel electrical low pressure fuel pumps
  - Normal Ops: only one pump working
- When pump fails (low fuel pressure): automatic switch over to other pump
  - When ECU switches over: fuel pumps switch over as well
- For TKOF, LDG and with fuel press failure: both pumps switched on manually with FUEL PUMP switch
- FUEL PUMP ON with CROSSFEED normally prohibited (only for emergency; special maintenance of high pressure pump required)

Fuel pumps

Fuel pumps

CHECK BEFORE ENGINE START
7 Fuel pumps (2) ..... OFF 7

CHECK AFTER ENGINE START
4 Fuel pumps (2) ..... check OFF 4
5 Fuel selectors (2) ..... X-FEED 5

BEFORE TAKE OFF CHECK
22 Fuel pumps (2) ..... ON 22
23 Parking brake ..... RELEASED 23
End of Checklist

AFTER TAKE-OFF PROCEDURE
Brakes ..... APPLY
Gear ..... UP
Fuel pumps (2) ..... OFF
Climb power ..... 92% / 2100 RPM
Landing light ..... OFF

CLIMB TO CRUISE CHECK
3 Fuel pumps (2) ..... CHECKED OFF 3

DESCENT / APPROACH CHECK
8 Fuel pumps (2) ..... ON 8

AFTER LANDING CHECK
3 Fuel pumps (2) ..... OFF 3

Fuel System

- New warning annunciation:
  L/R FUEL PRES

AUX fuel tanks

- Transfer pumps are now called „auxiliary pumps“:
  - AUX PUMPS

Diamond DA42 NG

Flight Controls

Variable elevator backstop

- Normal elevator „up" deflection: 15,5°
- Limited to „13° up" when both power levers above 20% (approach power setting) ~~and flaps LDG~~
- Reason: With full elevator deflection in case of stalling the handling qualities and stall characteristics are degraded
- Preflight check of this device is mandatory!
- „STICK LIMIT" caution when variable stop not in proper position

Variable elevator backstop

Power levers	Backstop shall be	If Backstop is	Caution light
Both LOW	unlimiting	limiting	STICK LIMIT
Split			
Both HIGH	limiting	unlimiting	STICK LIMIT

Variable elevator backstop Preflight check

CHECK BEFORE ENGINE START continued

30	Flaps	LDG	30
31	Variable elevator backstop	CHECK	31
	Control stick	*AFT and HOLD*	
	Power levers	*MAX*	
	Check backstop limit decreasing		
	Power levers	*IDLE*	
	Check backstop limit increasing		
32	Flaps	UP	32

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Electrical System

Electrical system

- Generators: 70 A
- No Excitation Battery
  - ECU backup batteries serve as excitation batteries
- Battery capacity: 13,6 Ah
- ECU backup batteries: 7,2 Ah

Diamond DA42 NG

Performance

X-wind, soft ground

Max demonstrated crosswind component:

25 kts

Soft ground:

In addition to „grass increment“:
45% increase in take-off roll

TOD, TOR tabular format

values for ISA and MSL, at 1900 kg (4189 lb)	
Take-off distance to 50 ft (15 m) above take-off surface	733 m (2405 ft)
Take-off ground roll	458 m (1503 ft)

NOTE

The rate of climb with a power setting of 100% is 1180 ft/min (6.0 m/s) at MSL and ISA standard conditions.

LD, LR tabular format

Values for ISA and MSL, at 1805 kg (3979 lb), approach speed 84 KIAS	
Landing distance from 50 ft (15 m) above the landing surface	598 m (1962 ft)
Ground roll	353 m (1158 ft)

Values for ISA and MSL, at 1900 kg (4189 lb), approach speed 84 KIAS	
Landing distance from 50 ft (15 m) above the landing surface	618 m (2028 ft)
Ground roll	369 m (1211 ft)

Go around

Value for ISA and MSL, at 1805 kg (3979 lb)	84 KIAS
Constant gradient of climb	7.5 % (equals 4.3 climb angle) or 612 ft/min

Value for ISA and MSL, at 1900 kg (4189 lb)	84 KIAS
Constant gradient of climb	6.7 % (equals 3.8 climb angle) or 547 ft/min

Required gradient acc. CS 23.77 (a): 3,3% at Sea Level

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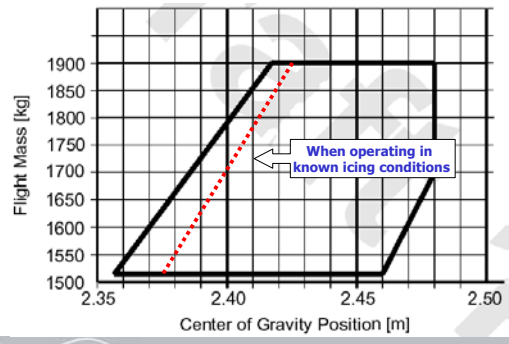
Center of gravity envelope

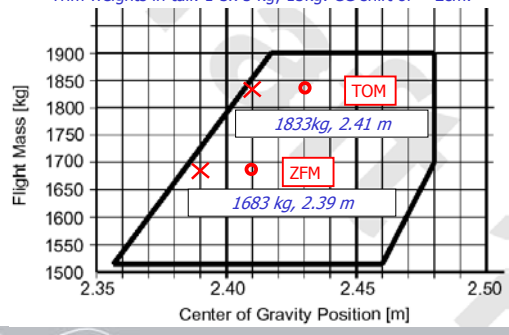


M&B calculation

	Lever arm	Mass (kg)	Moment (kgm)
Empty mass		1450	3488.0
Front seats	*170 x 2.30 = 391.0*		391.0
Rear seats	3.25	0	0.0
Nose baggage	0.60	0	0.0
Cockpit baggage	3.89	30	116.7
Baggage extension	4.54	0	0.0
De-icing fluid	1.00	33	33.0
Zero Fuel Mass	2.39	4028.7 : 1683 = 2.39	
Fuel (main tanks)	2.63	150	394.5
Fuel (AUX tanks)	3.20		
Total TKOF Mass	2.41	4423.2 : 1833 = 2.41	

Center of gravity envelope

Trim weights in tail: 1-3x 5 kg; 15kg: CG shift of ~ 2cm:



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Tire pressure

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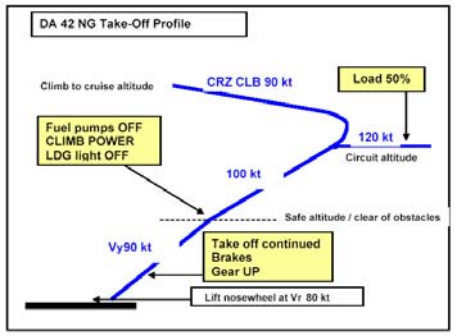
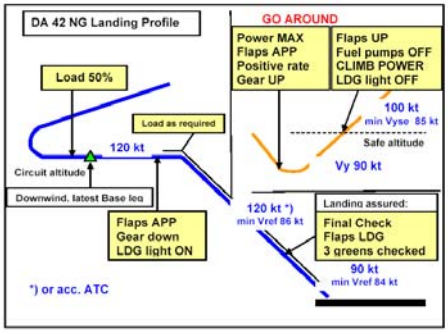
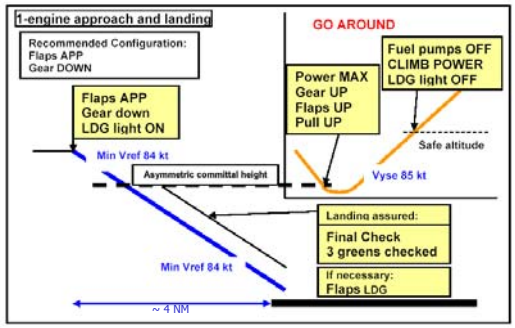
Take off



Landing



1-engine approach



Happy landings !