

Vliegen met een DC3 Dakota

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LaMaMa 18 mei 2015

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Vliegen met een DC3 Dakota

Indeling presentatie

- kenmerken van de DC3
- propeller pitch (propeller-hendel)
- motor vermogen
 - Manifold Pressure (gas-hendel)
 - mengsel brandstof/lucht (mixture-hendel)
- taxien
- DC3 procedures (checklist)
- oefenvlucht

Vliegen met een DC3 Dakota

De DC-3 is een van succesvolste vliegtuigen ooit gebouwd. Er werden bijna 16.000 machines gebouwd waarvan 11.000 door Douglas zelf

De DC-3 kwam voort uit de DC-2, die weer voort kwam uit de DC-1

Het vliegtuig werd op verzoek van American Airlines (AA) ontwikkeld

AA wilde een vliegtuig dat beter presteerde dan de DC-2 en meer passagiers kon vervoeren

Douglas vergrootte de romp en plaatste krachtiger motoren

Vliegen met een DC3 Dakota

De Dakota bood plaats aan aan 28 tot 35 passagiers

Eerste vlucht op december 1935, levering aan AA juli 1936

AA richtte haar vliegtuigen in voor 16 passagiers (lange vluchten) en 24 passagiers (korte vluchten)

Binnen enkele jaren vlogen er honderden Dakota's rond over de hele wereld

KLM was de eerste Europese klant

Tijdens de Tweede Wereldoorlog werd het vliegtuig ook veel ingezet.

Er werden militaire versies ontwikkeld waarvan de C-47 Skytrain de succesvolste was

Vliegen met een DC3 Dakota

DC3 FSX standaard



DC3 DDA Amalia



DC3 FSX Maam
Add-On



Vliegen met een DC3 Dakota

Soort motoren: Pratt & Whitney R-1830-S1C3G Twin Wasp



Kenmerken

- Twee motoren
- Driebladige propellers
- Staartwiel

Afmetingen

- Lengte: 19,7 m
- Spanwijdte: 30 m
- Hoogte: 5,2 m

Vliegen met een DC3 Dakota

Prestaties

Plafond: FL232 / 7100 m
Kruissnelheid: 368 km/u
Vliegbereik: 2160 km



Accommodatie

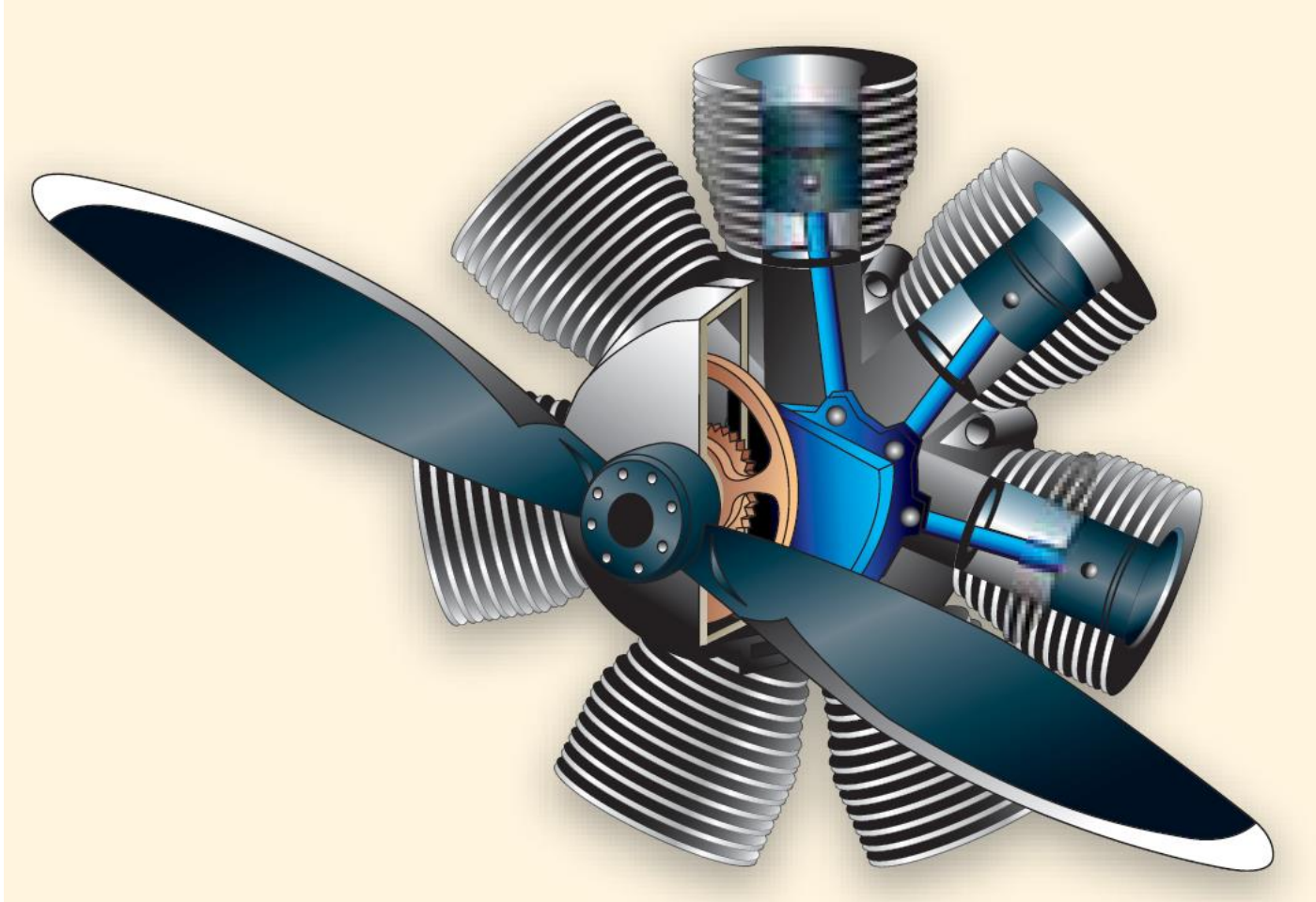
Maximaal 35 passagiers in één klasse
Maximaal 3900 kg vracht

Vliegen met een DC3 Dakota



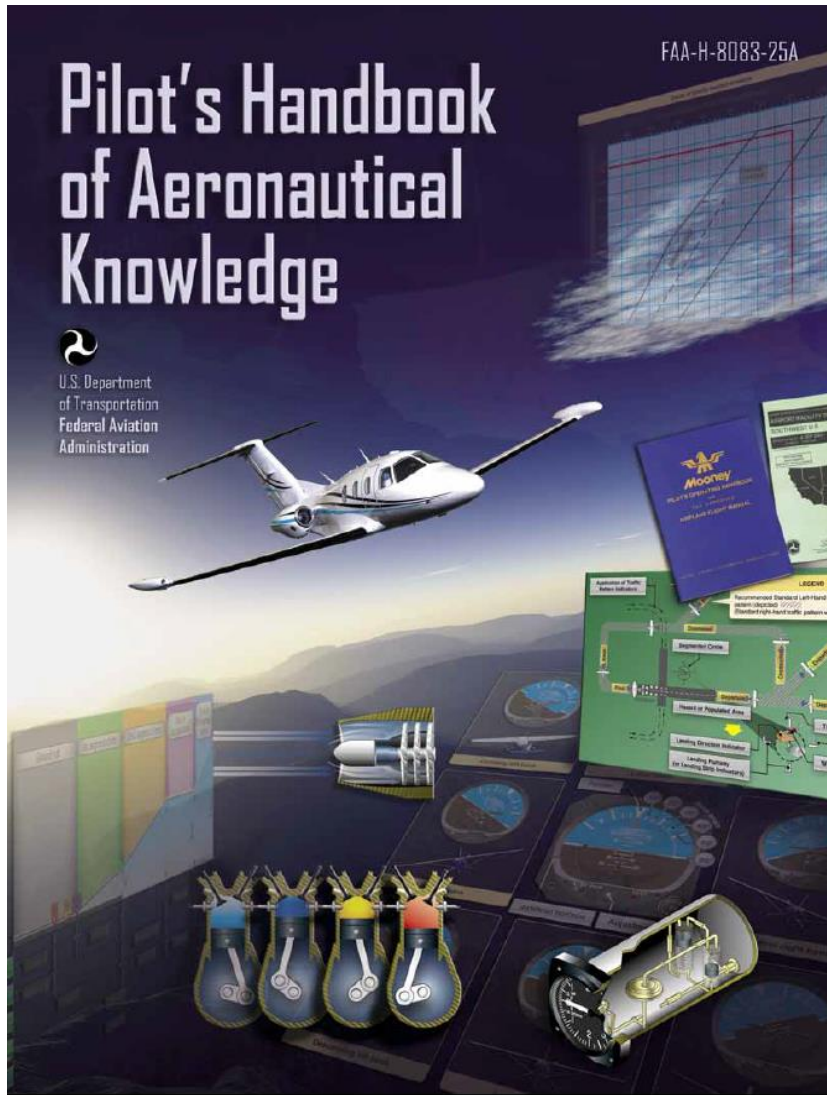
3 bladige variabele-pitch propeller

Vliegen met een DC3 Dakota



Radiaal motor
7 zuigers op een krukas

Vliegen met een DC3 Dakota

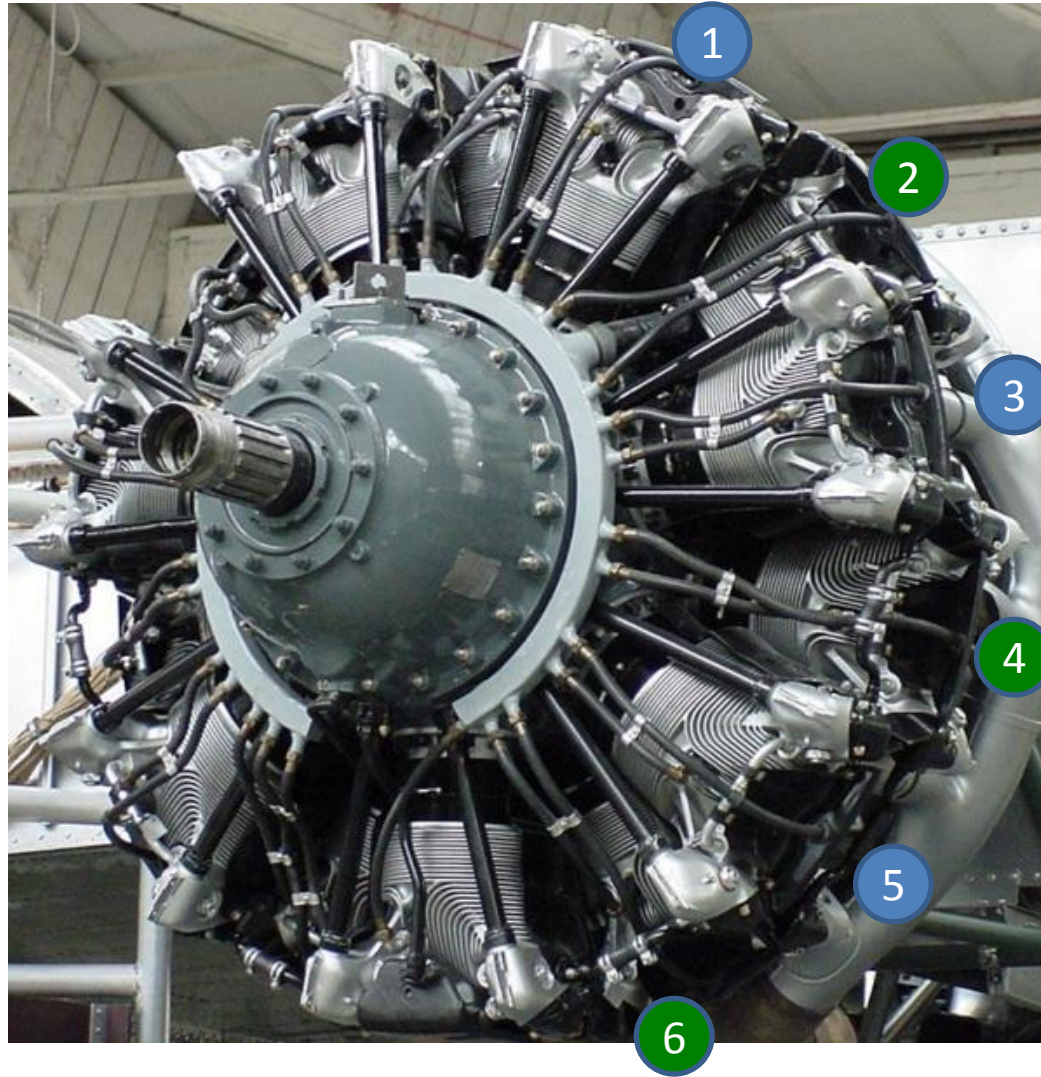


Een aantal figuren zijn gekopieerd uit dit handboek

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Vliegen met een DC3 Dakota

Luchtgekoeld
radiaal ontwerp



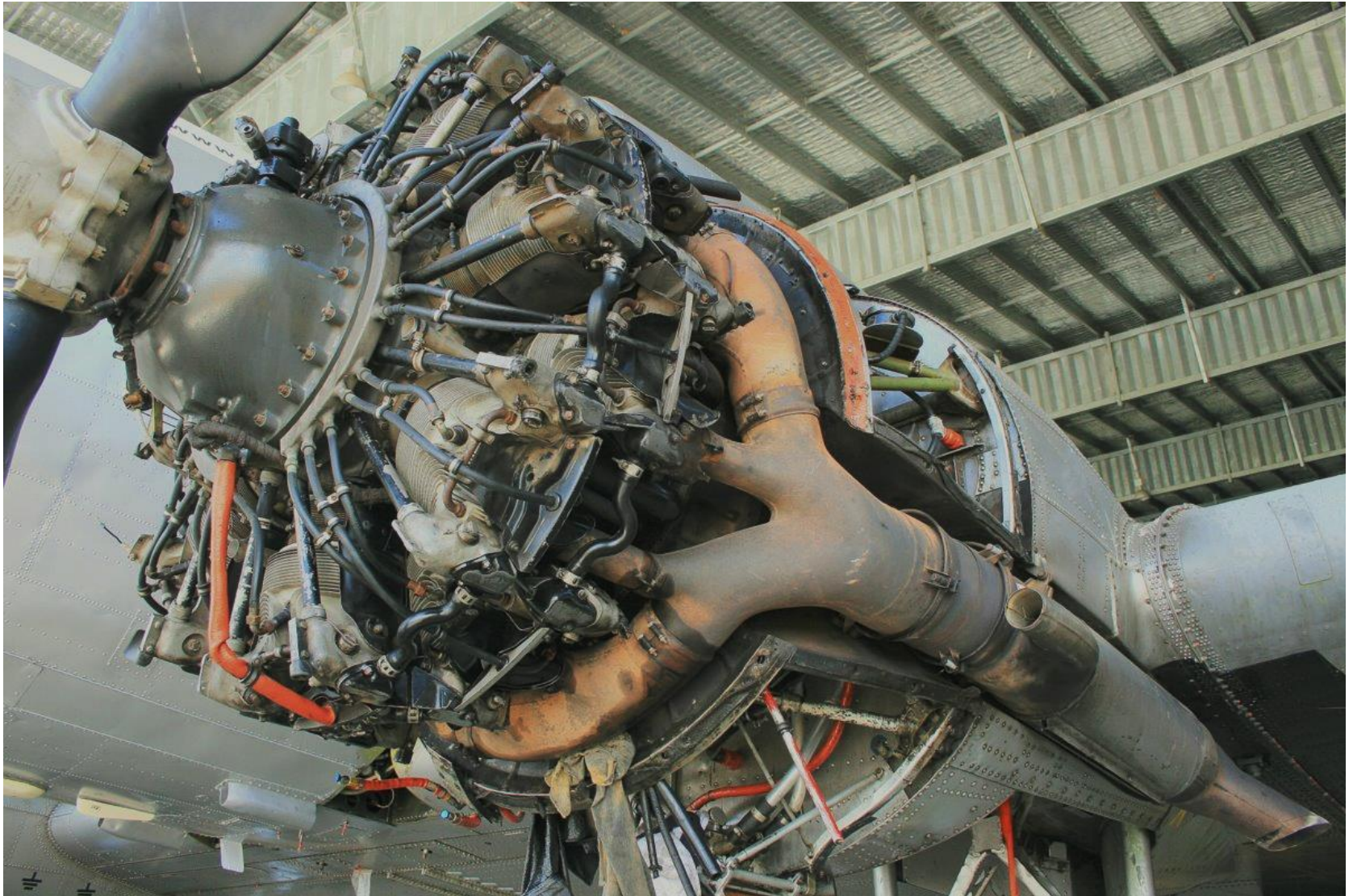
Pratt & Whitney R1830-92 Twin Wasp motor 1200 hp
Twee-rijen met 7 cilindres, totaal 14-cylinders,

Vliegen met een DC3 Dakota



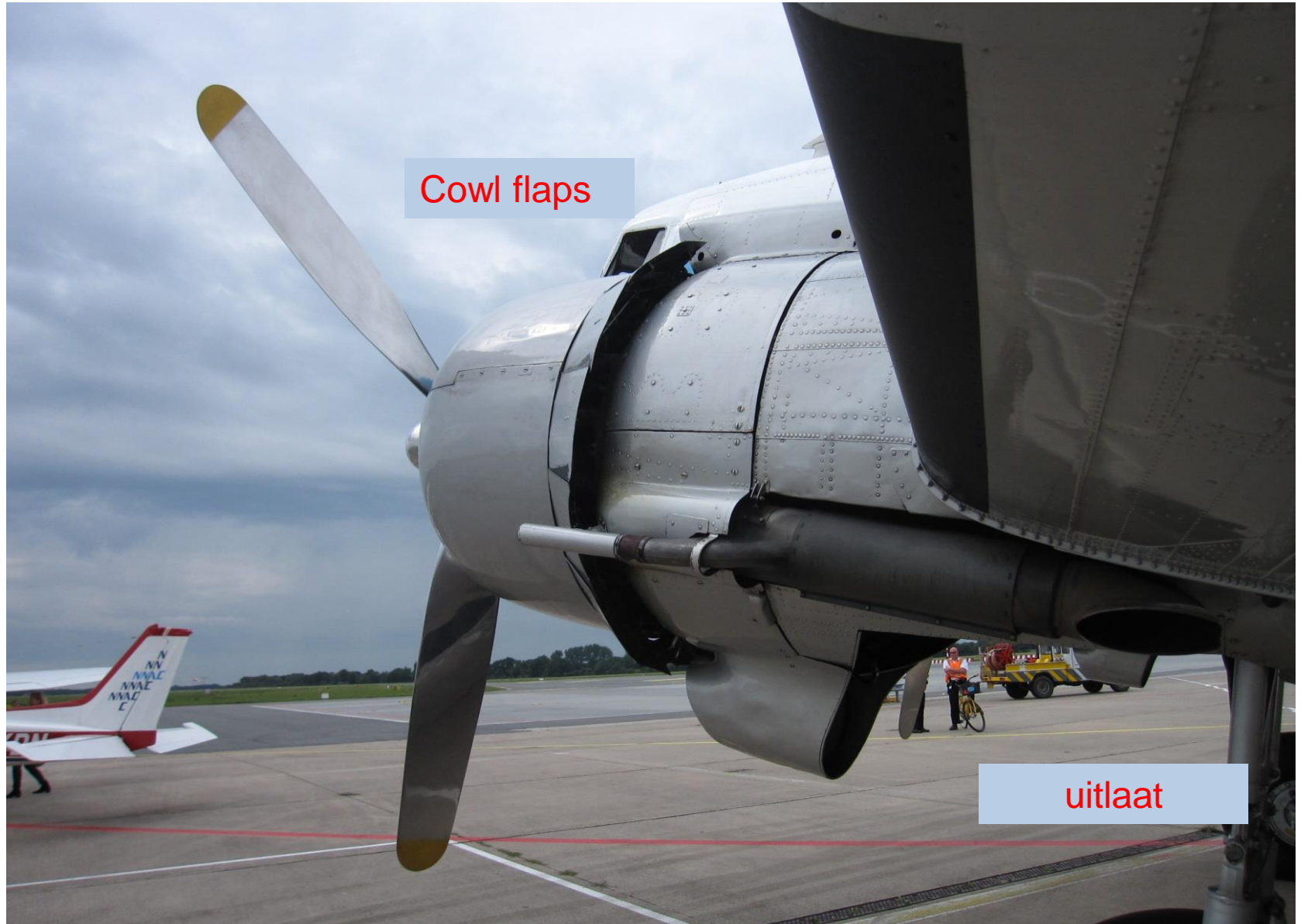
opengewerkt model, zuigers en kleppen goed te zien

Vliegen met een DC3 Dakota



motor gemonteerd op de linker vleugel

Vliegen met een DC3 Dakota



Cowl flaps

uitlaat

motor gemonteerd op de linker vleugel

Vliegen met een DC3 Dakota



Vliegen met een DC3 Dakota

DC3 DDA Amalia



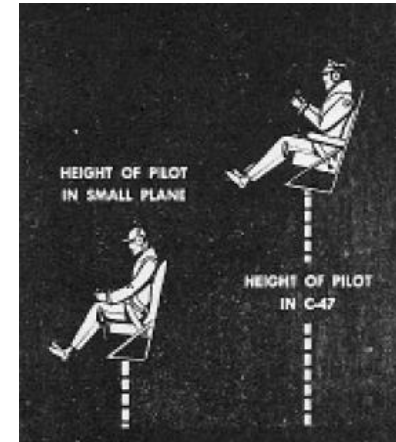
reëel
en
virtueel

DC3 FSX Maam
Add-On



Vliegen met een DC3 Dakota

DC3 DDA Amalia



groot verschil in uitzicht
met name van belang bij nacht zicht
(verlichting)



Vliegen met een DC3 Dakota

Cockpit van de Amalia



10/08/2014

Vliegen met een DC3 Dakota

Propeller-links
Propeller-rechts

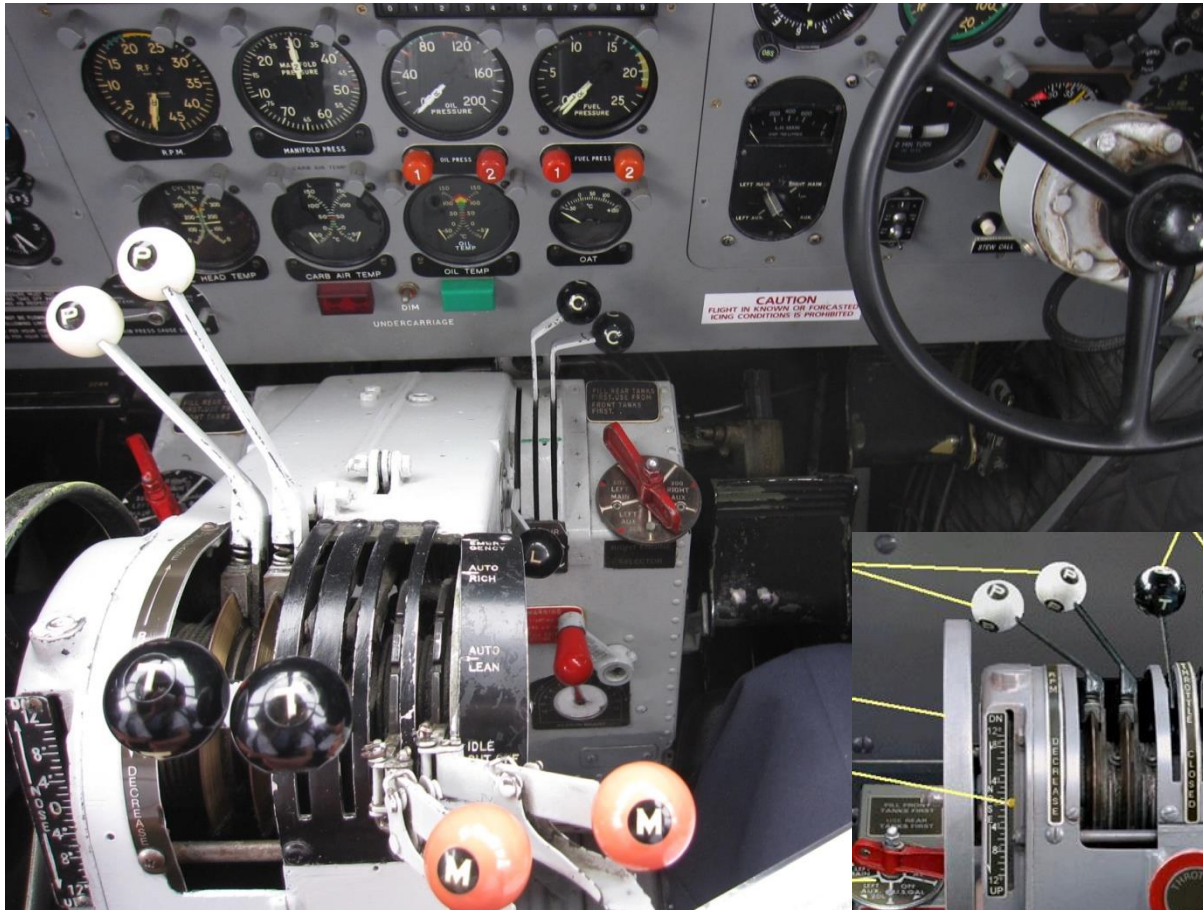
Throttle-links
Throttle-rechts



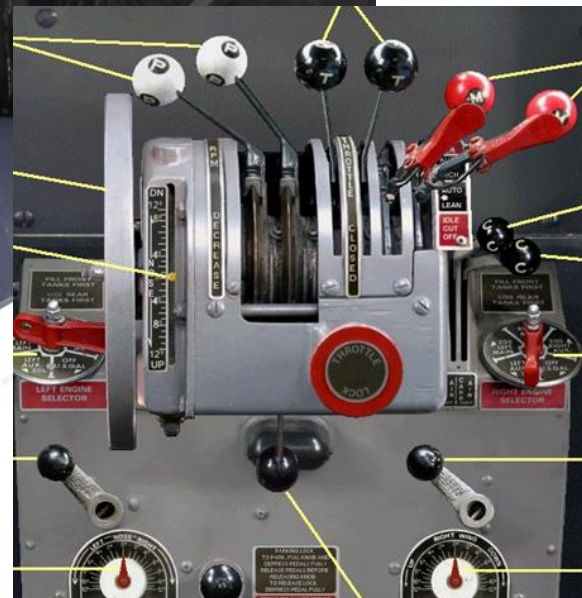
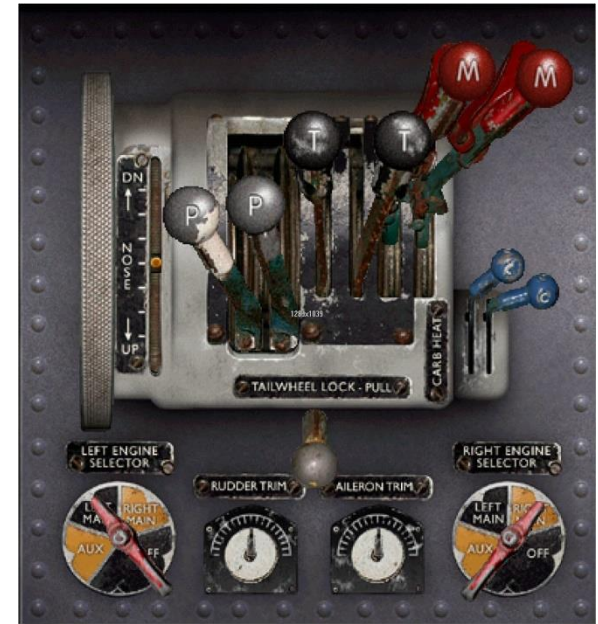
Mixture-links
Mixture-rechts

Vliegen met een DC3 Dakota

DC3 DDA Amalia



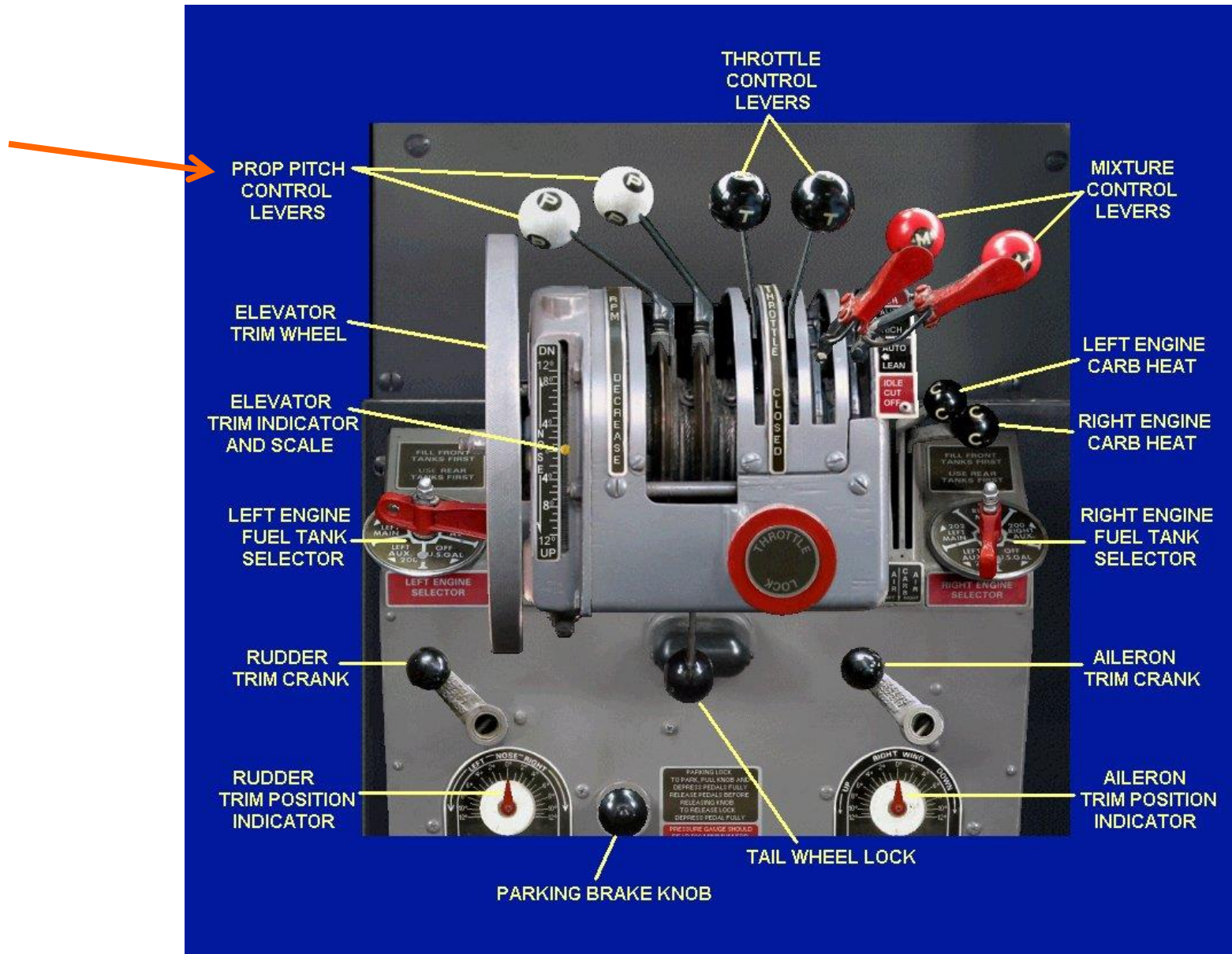
DC3 FSX standaard



DC3 FSX Maam Add-On

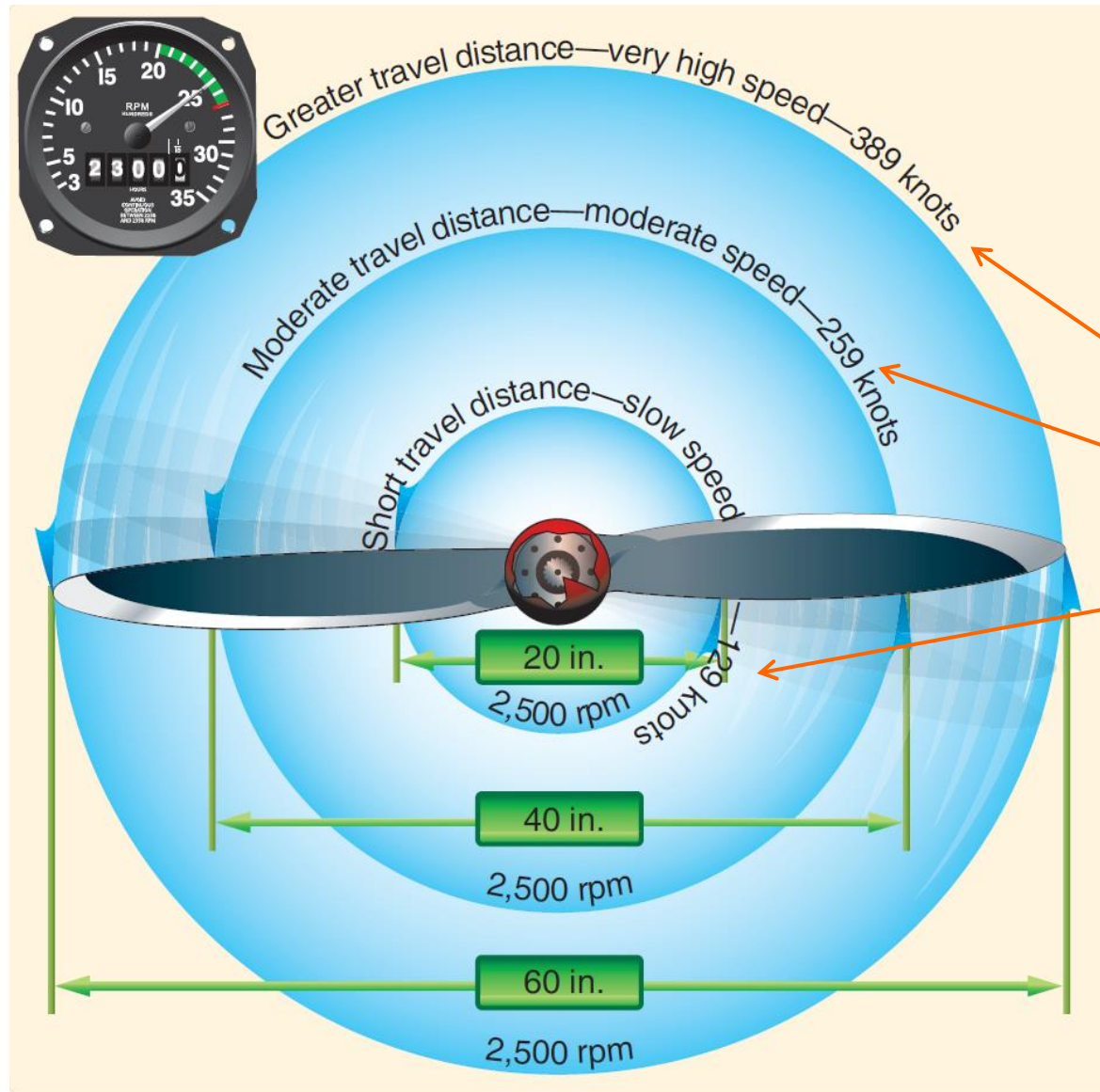
Vliegen met een DC3 Dakota

DC3 FSX Maam Add-On



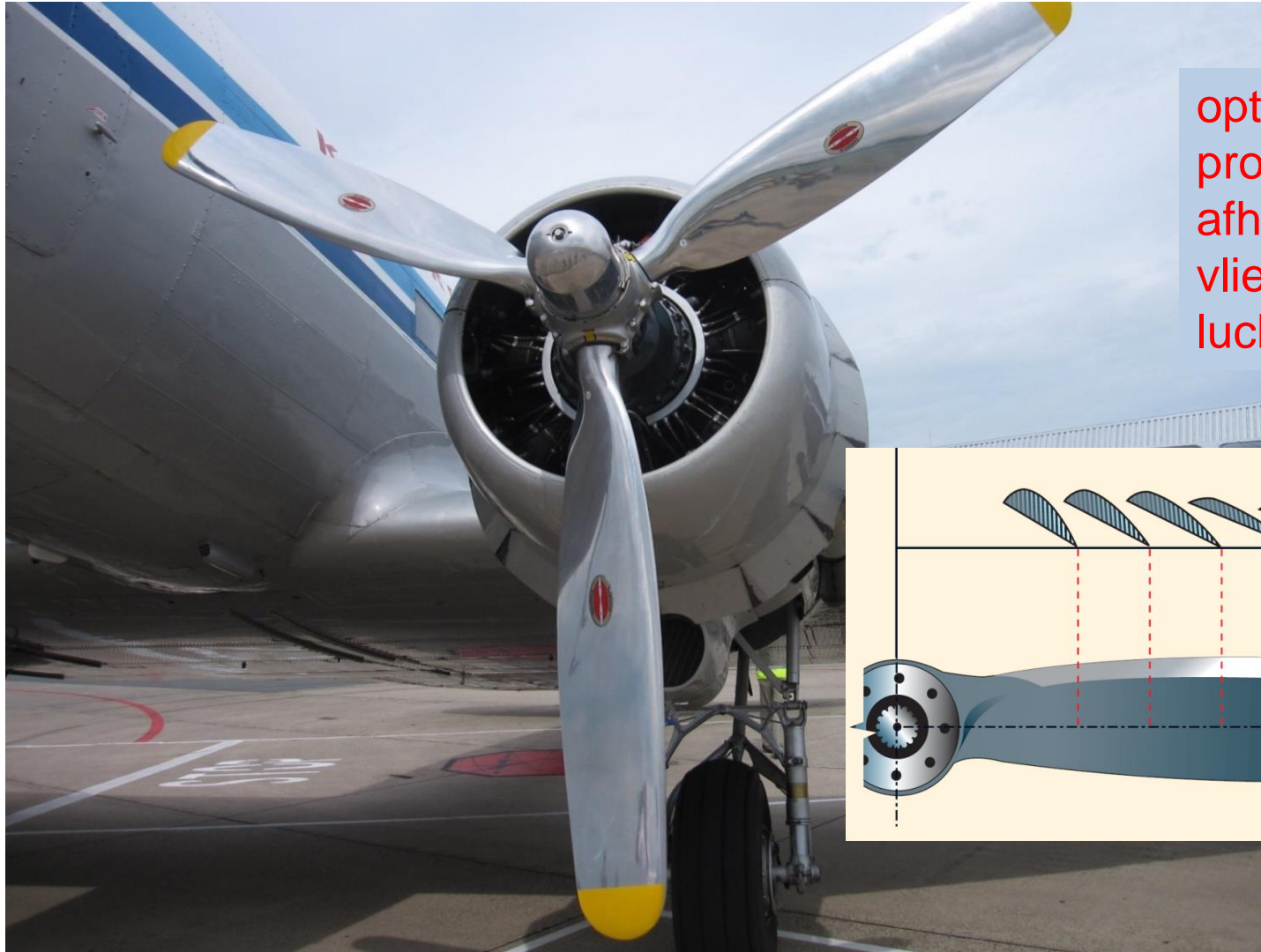
Vliegen met een DC3 Dakota

toerental
2500 rpm

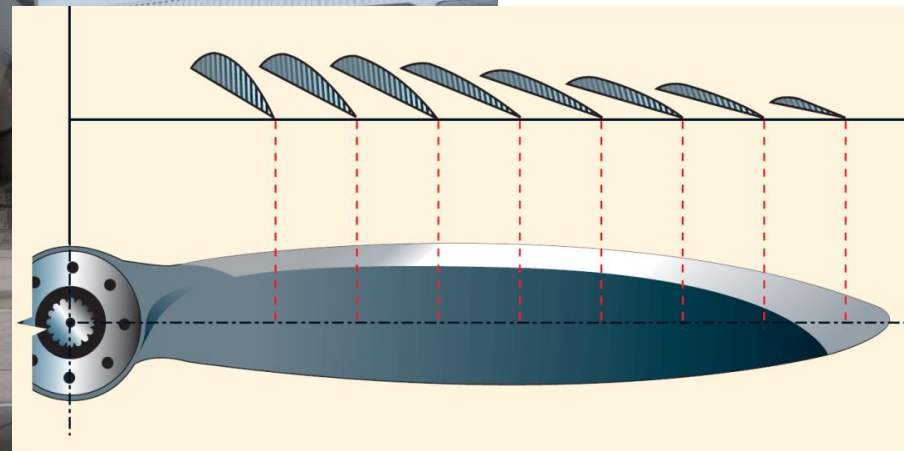


relatie tussen afgelegde afstand en snelheid
voor verschillende delen van een propellerblad

Vliegen met een DC3 Dakota

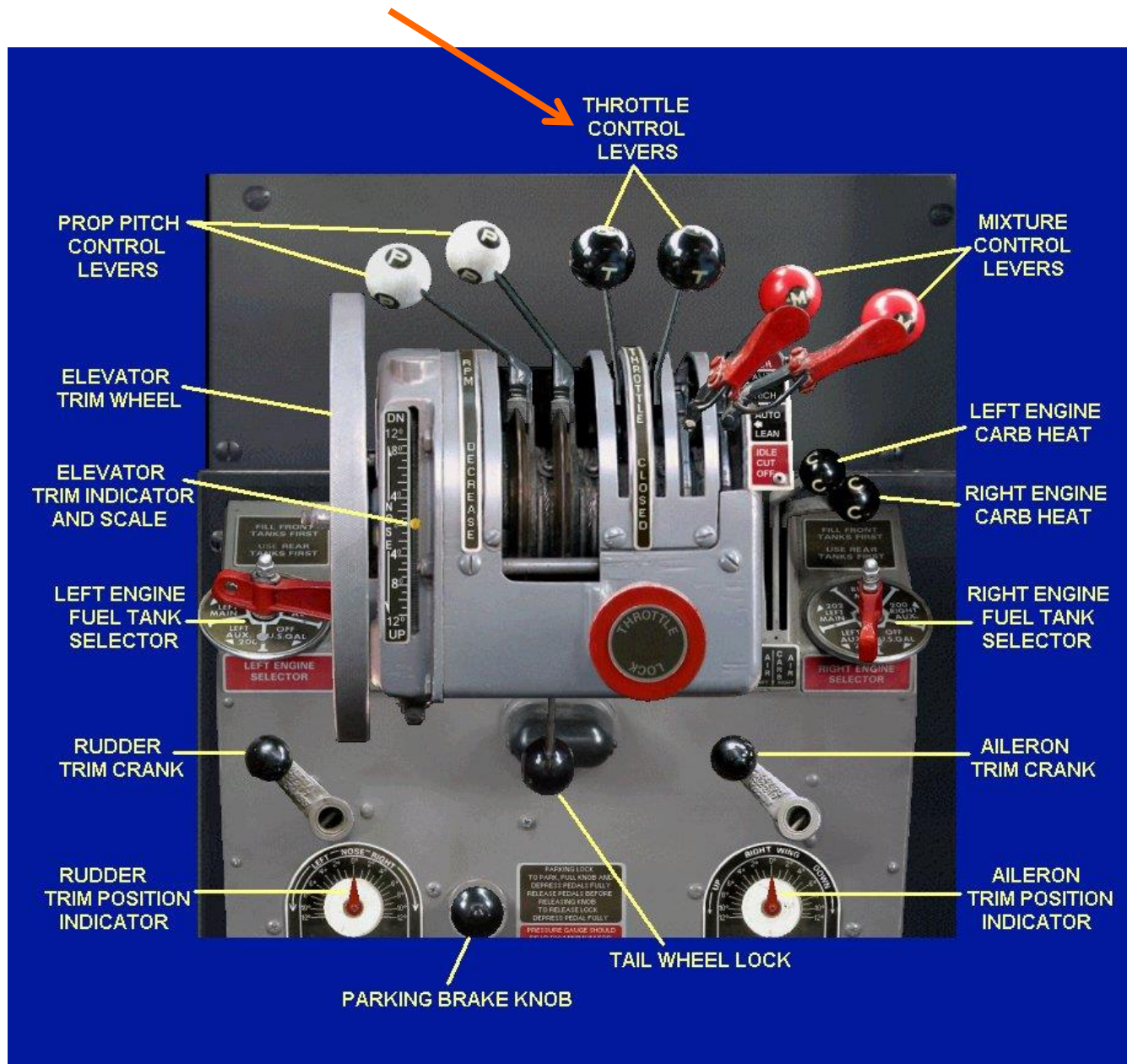


optimum stand
propellerblad
afhankelijk van
vliegsnelheid en
luchtdruk



verschillende propellerblad hoek vanaf as tot tip van de propeller

Vliegen met een DC3 Dakota



Vliegen met een DC3 Dakota



propeller pitch vast

motor rpm aangegeven op toerental meter

is maat voor motor vermogen



propeller pitch variabel

motor vermogen aangegeven door de manifold druk meter

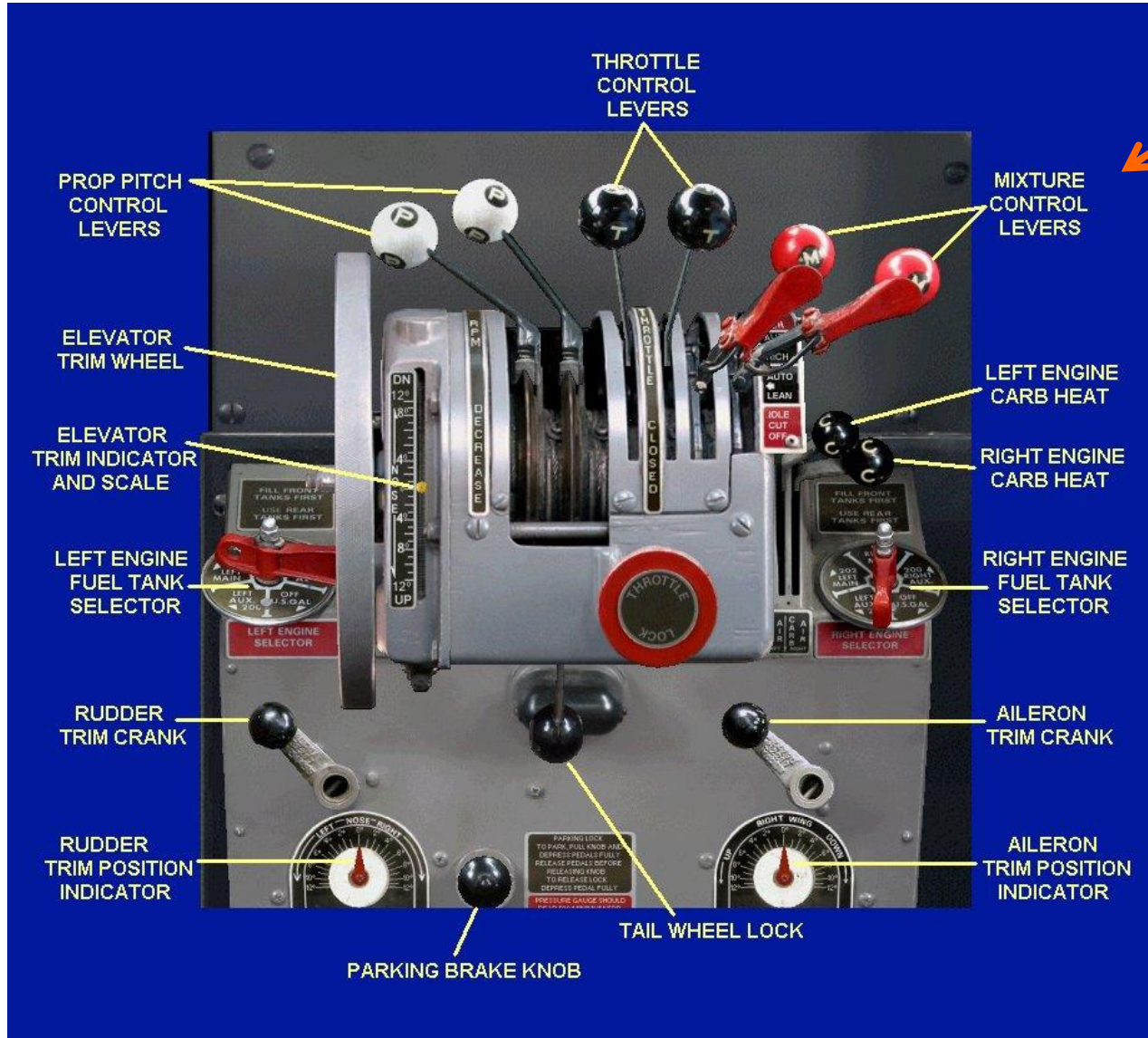
DC3FSX



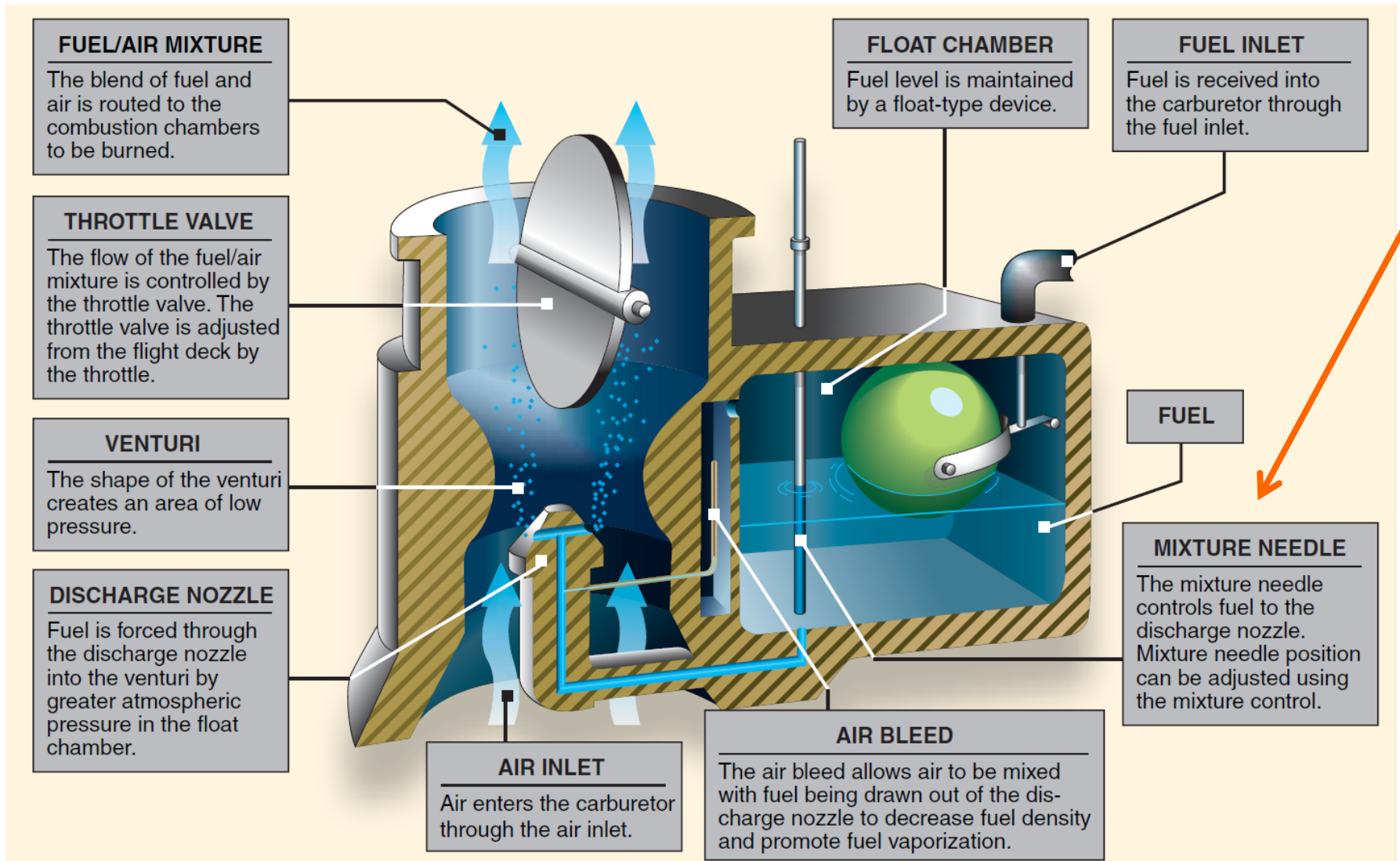
MP= manifold pressure

manifold = inlaat spruitstuk tussen carburateur en cylinders

Vliegen met een DC3 Dakota



Vliegen met een DC3 Dakota



Float-type carburetor.

Vliegen met een DC3 Dakota

DC3 FSX standaard
hoofdpaneel



Vliegen met een DC3 Dakota



Rechter motor:

rpm **0**

MP **30**

Linker motor:

rpm **1000**

MP **10**

rpm

MP



Vliegen met een DC3 Dakota



Rechter motor:

rpm **1000**

MP **10**

Linker motor:

rpm **1000**

MP **10**

rpm

MP



Vliegen met een DC3 Dakota



Rechter motor:

rpm **1000**

MP **10**

Linker motor:

rpm **2250**

MP **42**

rpm

MP

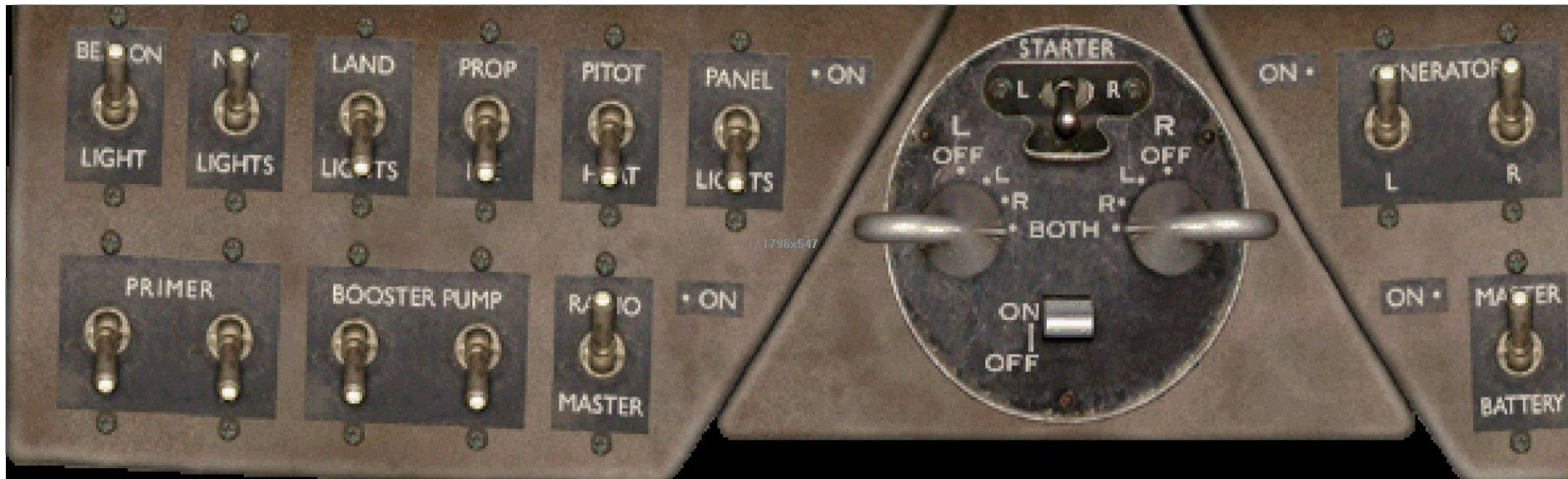


Vliegen met een DC3 Dakota

Elektrisch schakelpaneel

lichten

generatoren



primer

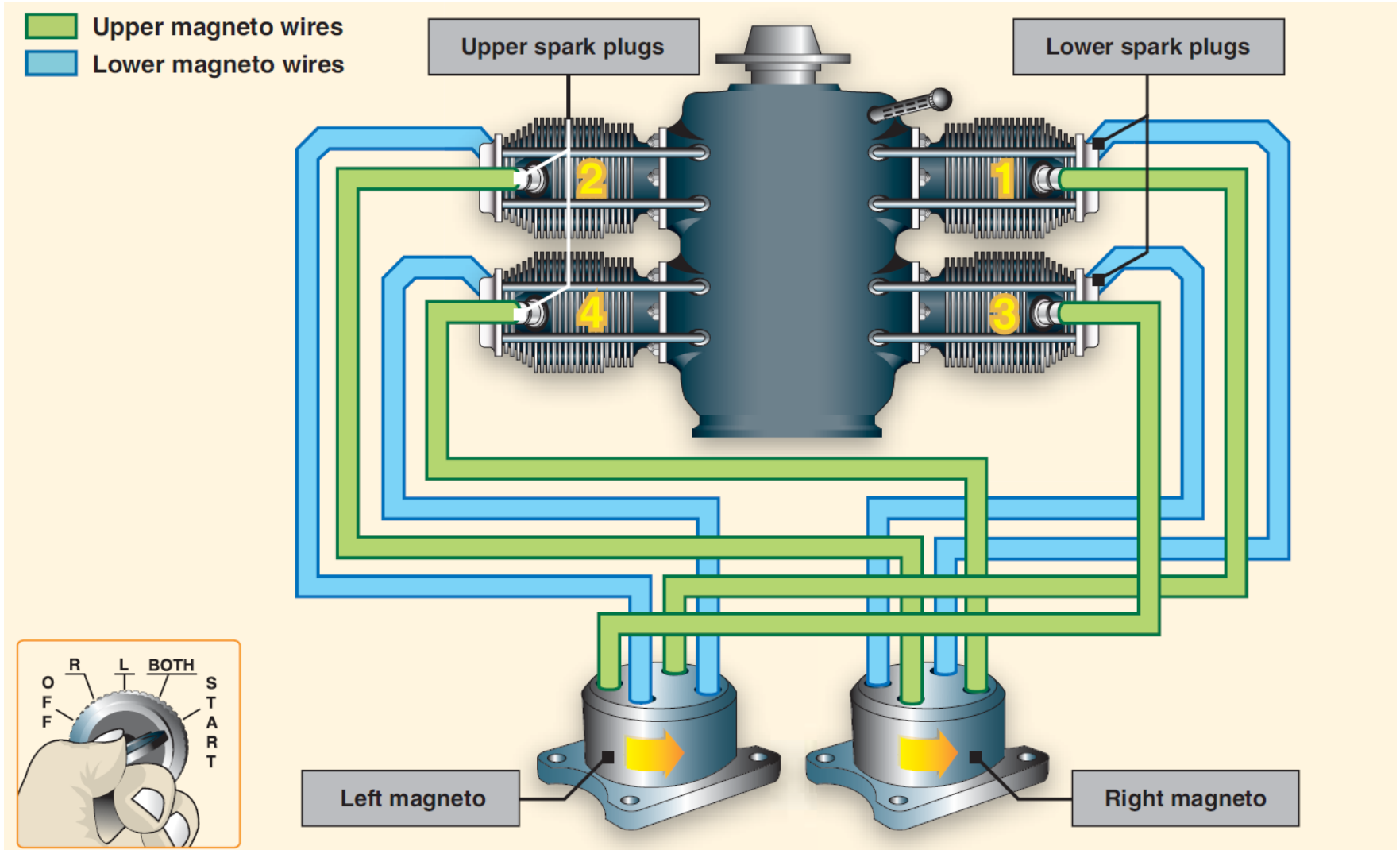
booster

radio

magneto en starter

accu

Vliegen met een DC3 Dakota



onderdelen van het ontstekings systeem

Vliegen met een DC3 Dakota



**staartwiel
vrij draaiend
vastzetten in nulstand**

Vliegen met een DC3 Dakota



Taxien

- differentieel remmen
- differentieel gas geven

Taxien, naar links

- linker wiel remmen
- rechter motor gas geven



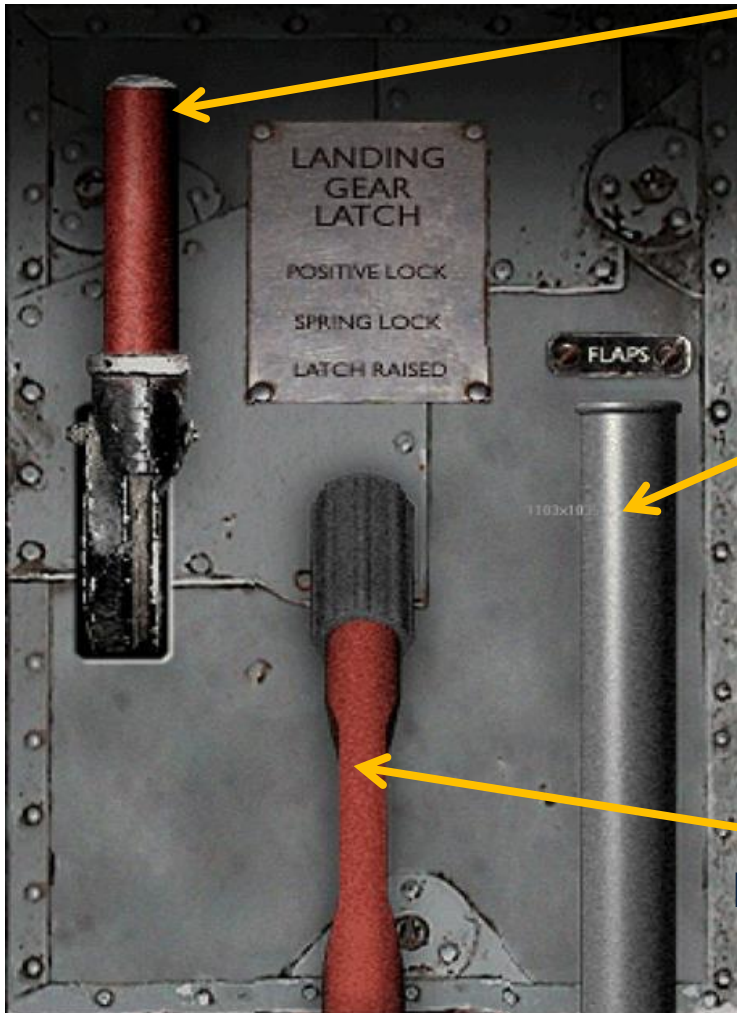
Vliegen met een DC3 Dakota



DC3 Landingsgestel

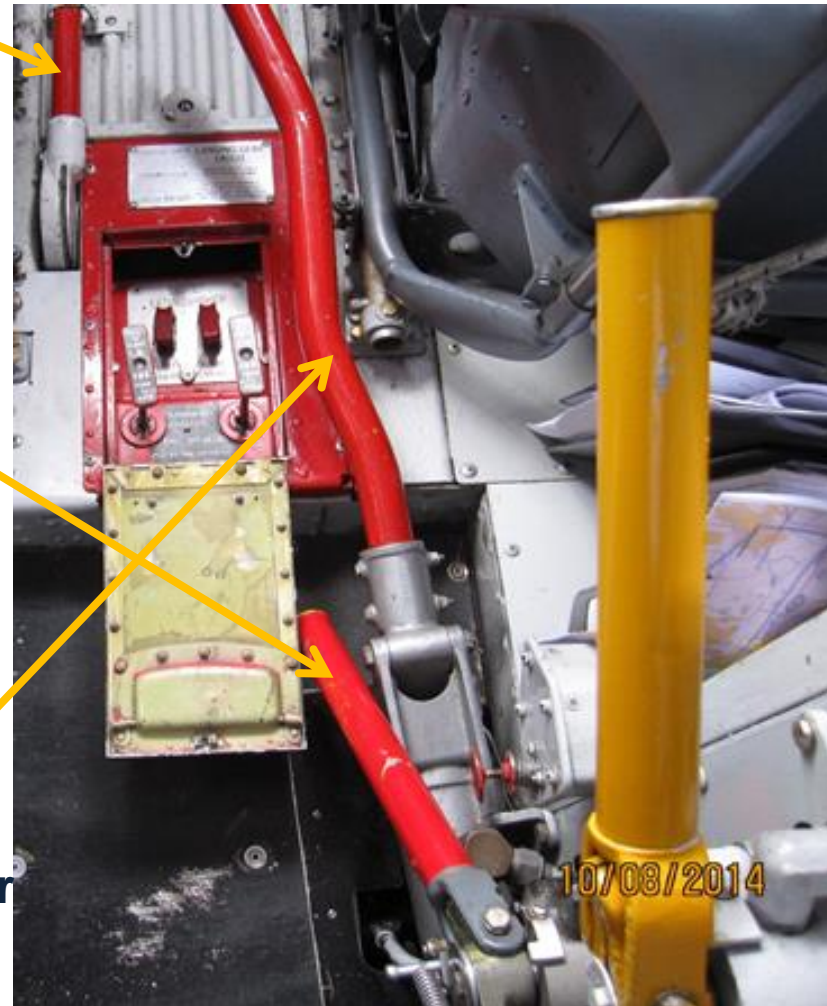
Vliegen met een DC3 Dakota

DC3 FSX standaard



Landing gear
vergrendeling

DC3 DDA Amalia



Flaps

Landing gear
handle

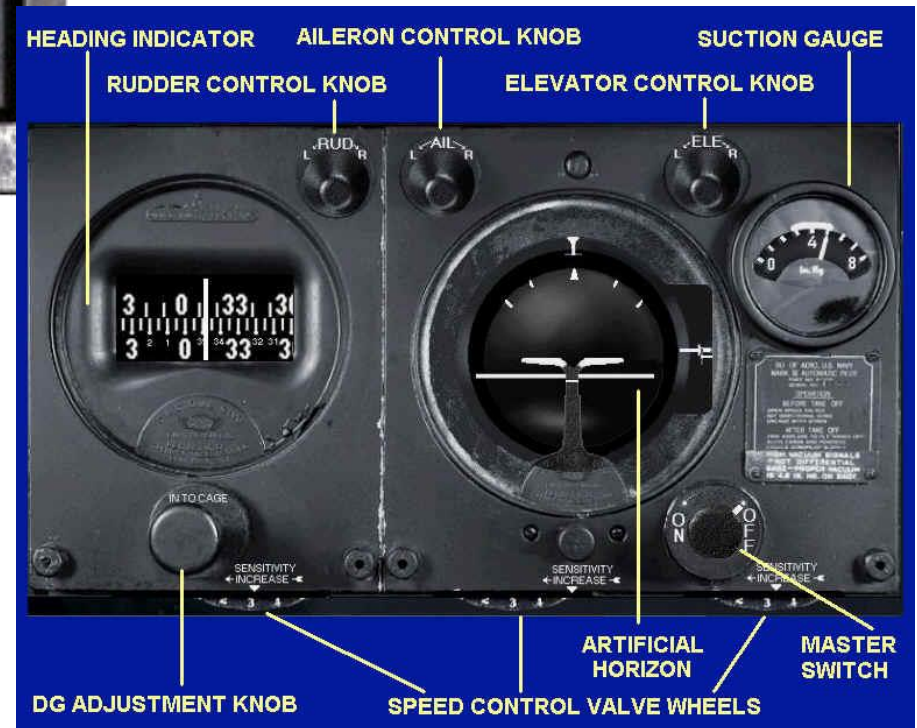
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Vliegen met een DC3 Dakota



Auto pilot:
houdt rudder en elevator
constant

- vliegtuig op gewenste koers en klim brengen
- trimmen
- heading en pitch van AP instellen
- AP inschakelen



DOUGLAS DC-3 PROCEDURES

BEFORE STARTING		
<input type="checkbox"/> Wing Flaps	UP NEUTRAL; INDICATING UP	(press F6 as necessary)
<input type="checkbox"/> Gear Handle	DOWN	
<input type="checkbox"/> Spring Latch	LATCHED	
<input type="checkbox"/> Parking Brake	SET	(press CTRL+PERIOD KEY)
<input type="checkbox"/> Master Battery	ON	
<input type="checkbox"/> Radio Master	OFF	
<input type="checkbox"/> Generators	ON	
<input type="checkbox"/> Nav Lights	AS REQUIRED	
<input type="checkbox"/> Magnetos	OFF	(press M+MINUS SIGN until Off)
<input type="checkbox"/> Pitot Heat	OFF	
<input type="checkbox"/> Prop. Anti-Ice	OFF	
<input type="checkbox"/> Carb. Heat	COLD	(press H to toggle)
<input type="checkbox"/> Fuel Gauges	CHECKED	
<input type="checkbox"/> Fuel Valves	MAINS	
<input type="checkbox"/> Hydraulic Pressure	UP	
<input type="checkbox"/> Props	FORWARD	(press CTRL+F3 until fully forward)
<input type="checkbox"/> Throttles	CRACKED	(press F3 and F2 as necessary)
<input type="checkbox"/> Mixtures	IDLE CUTOFF	(press CTRL+SHIFT+F2 until fully back)
<input type="checkbox"/> Trim Tabs	(3) SET	
<input type="checkbox"/> Cowl Flaps	OPEN & OFF	
<input type="checkbox"/> Engine Rest Manifold Pressure	NOTED	
<input type="checkbox"/> Flight Controls	FREE/Full travel	
<input type="checkbox"/> Beacon	ON	
<input type="checkbox"/> Boost Pumps	OFF	

DOUGLAS DC-3 PROCEDURES

STARTING

Press CTRL+E to initiate engine autostart sequence

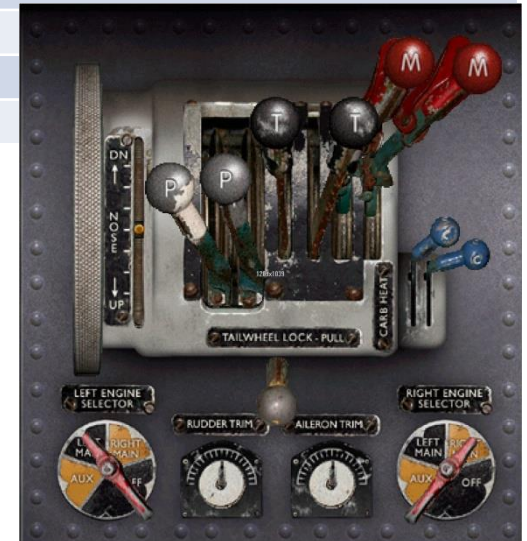
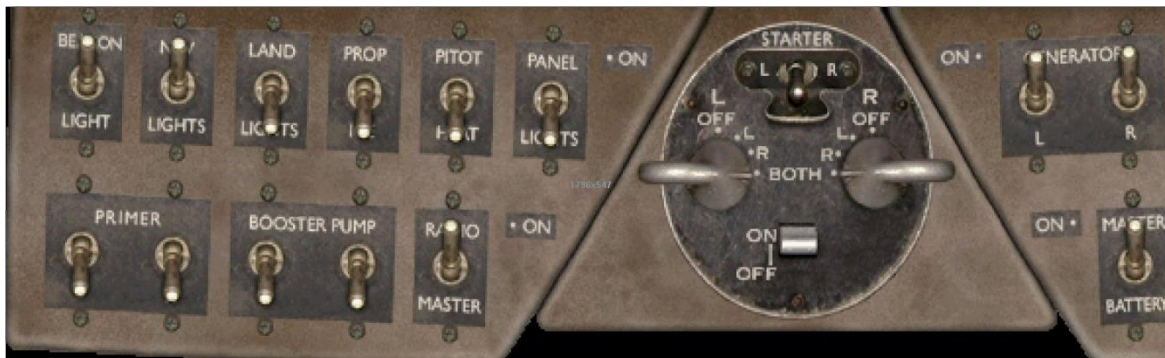
(press CTRL+E)

Start each engine in sequence (1, 2):

(press E, then 1 or 2 to move focus to that engine)

DOUGLAS DC-3 PROCEDURES

STARTING		
[.] Master Battery	ON	
[.] Mixture	AUTO RICH	(press CTRL+SHIFT+F3 until fully forward)
[.] Throttle	CRACKED	(press F3 and F2 as necessary)
[.] Propeller Control	FULL FORWARD	(low pitch, press CTRL+F3 until fully forward)
[.] Master Ignition Switch	ON	
[.] Fuel Boost Pump	ON (right engine)	
[.] Magnetos	BOTH	(press M+PLUS SIGN until Both)
[.] Prime	AS REQUIRED	
[.] Starter Switch	ENGAGE	(press M+PLUS SIGN to Start and hold until engine starts)
[] Oil Pressure	CHECK	
[] Fuel Pressure	CHECK	
[] Fuel Boost Pump	OFF	
[] Oil Pressure	CHECK	
[] Fuel Pressure	CHECK	
[] Vacuum Pressure	CHECK	
[] Hydraulic Pressure	CHECK	



DOUGLAS DC-3 PROCEDURES

AFTER STARTING		
<input type="checkbox"/> Temps/Press	CHECK	
<input type="checkbox"/> Gear and Hydraulic Pressure	CHECK	
<input type="checkbox"/> Boost Pumps	OFF	
<input type="checkbox"/> Radio Master	ON	
<input checked="" type="checkbox"/> Tail Wheel	UNLOCKED FOR TAXI	

TAXI - WARM UP		
<input type="checkbox"/> Brakes	CHECK	(press PERIOD KEY)
<input type="checkbox"/> Gyro Instruments	CHECK	
<input type="checkbox"/> Altimeter	CHECK	
<input type="checkbox"/> Flight Instruments	CHECK	
<input type="checkbox"/> Carb Heat	CHECK	(press H to toggle)

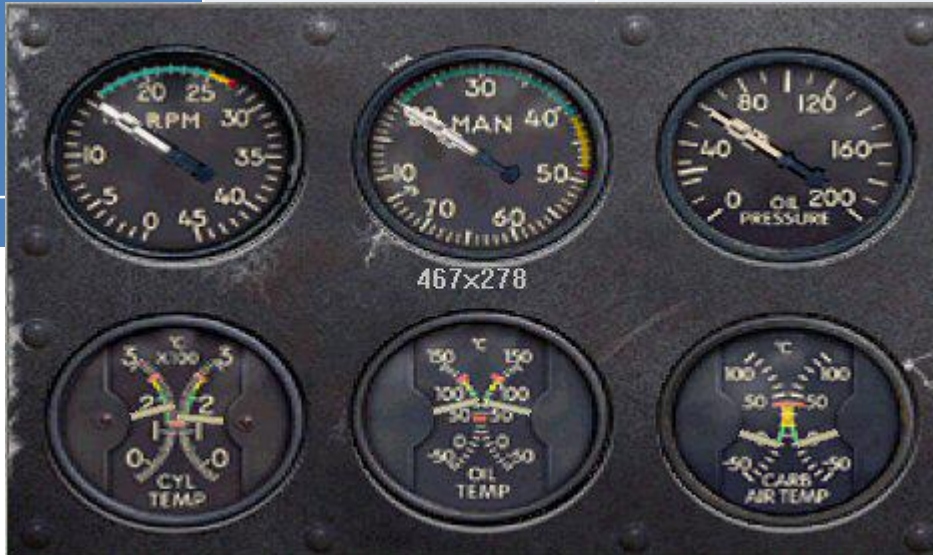


DOUGLAS DC-3 PROCEDURES

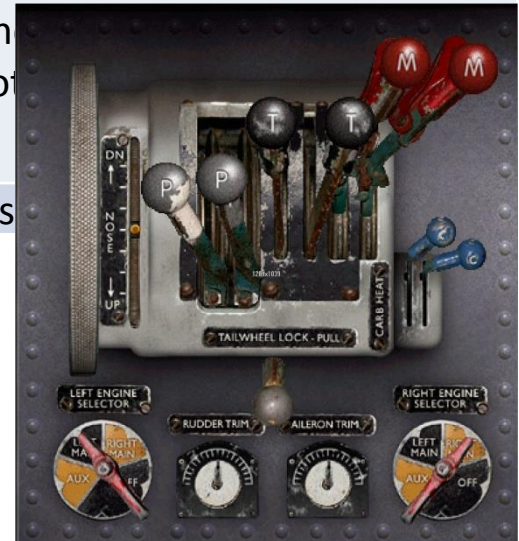
ENGINE RUN-UP		
[.] Parking Brake	SET	(press CTRL+PERIOD)
[.] Temps & Press	CHECK	
[.] Mixtures	AUTO RICH	(press CTRL+SHIFT+F3 until fully forward)
[.] Throttles	1500 RPM	(press F3 and F2 as necessary)
[.] Props	EXERCISE	(press CTRL+F2 and CTRL+F3 as necessary)
[.] Feathering	CHECK	(un-feather after 200 rpm drop)
[.] Generators	CHECK	
[] Heading Indicators	SET	
[] Vacuum Press	CHECK	
[] Pitot Heat	CHECK	
[]	CHECK	

[.] Magnetos

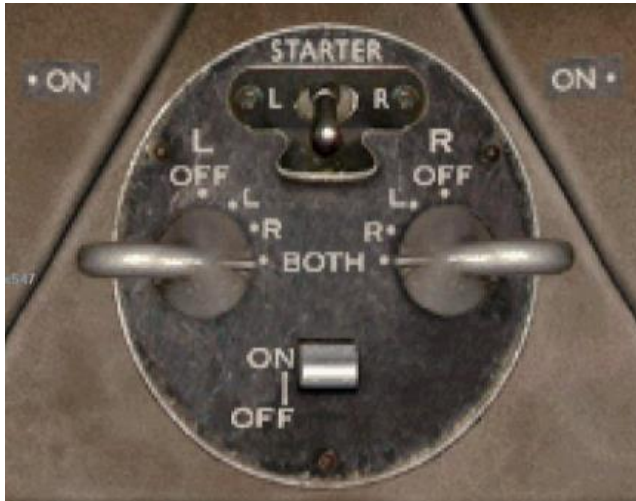
[.] Throttles



GN th
R, Bo
neces



DOUGLAS DC-3 PROCEDURES



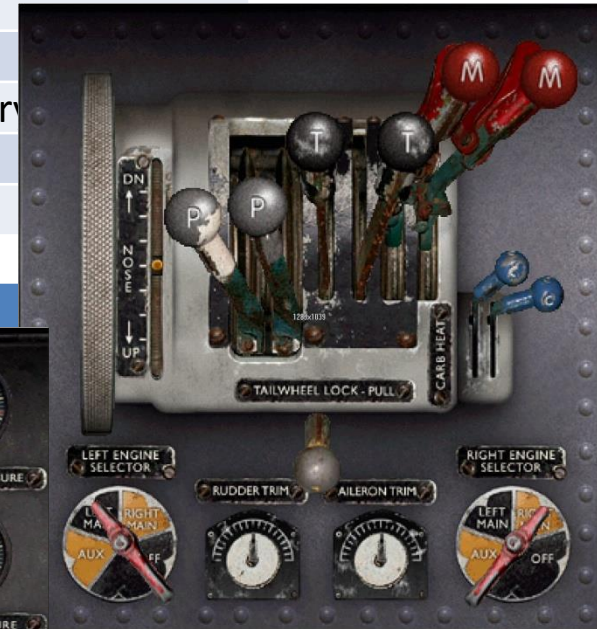
[] Mixtures	AUTO RICH	
[.] Throttles	1500 RPM	
[.] Props	EXERCISE	
[.] Feathering	CHECK	
[.] Generators	CHECK	
[] Heading Indicators	SET	
[] Vacuum Press	CHECK	
[] Pitot Heat	CHECK	
[.] Magnetos	CHECK <100 rpm drop on each <40 rpm drop between	(press M+MINUS SIGN then M+PLUS SIGN to L, R, Both)
[.] Throttles	1000 RPM	(press F2 and F3 as necessary)

DOUGLAS DC-3 PROCEDURES

PRE-TAKEOFF		
[.] Mixtures	AUTO RICH	(press CTRL+SHIFT+F3 until fully forward)
[.] Props	FORWARD	(press CTRL+F3 until fully forward)
[.] Trim Tabs	SET	
[] Flight Controls	FREE AND CORRECT	
[.] Flaps	SET	(press F7 and F6 as necessary)
[] Radios	SET	
[] Briefing	COMPLETE	

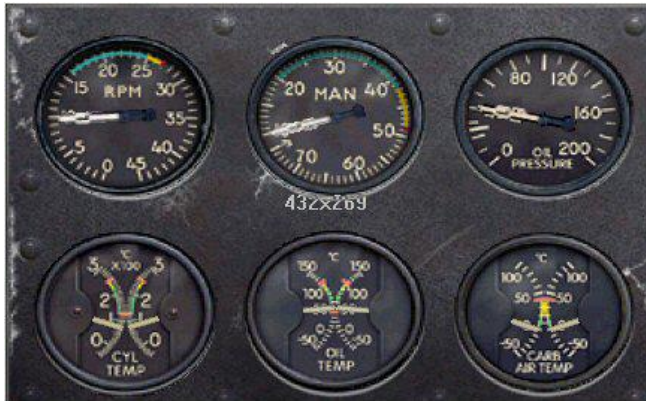
FINAL ITEMS

[.] Cowl Flaps	OPEN HALFWAY
[.] Boost Pumps	ON
[.] Pitot Heat	ON
[.] Tailwheel	LOCKED
[] Heading Indicator	CHECK



DOUGLAS DC-3 PROCEDURES

TAKEOFF AND CLIMB (at sea level)		
[.] Brakes	RELEASE	
[.] Mixtures	AUTO RICH	(press CTRL+SHIFT+F3 until fully forward)
[.] Throttles	48"Hg MANIFOLD PRESSURE	(press F2 and F3 as necessary)
[.] Propellers	2750 RPM	(press CTRL+F2 and CTRL+F3 as necessary)
[.] Landing Gear	RETRACT	(when positive rate of climb is established, press G)
--AT 105 KIAS--		
[.] Throttles	35'Hg MANIFOLD PRESSURE	(press F2 and F3 as necessary)
[.] Propellers	2350 RPM	(press CTRL+F2 and CTRL+F3 as necessary)
[.] Airspeed	MAINTAIN 105 KIAS	
--WHEN CLEAR OF OBSTACLES--		
[.] Airspeed	115-120 KIAS	



DOUGLAS DC-3 PROCEDURES

AFTER TAKEOFF & CLIMB		
<input type="checkbox"/> Landing Gear	VERIFY UP	
<input type="checkbox"/> Flaps	VERIFY UP	
<input type="checkbox"/> Wings	CLEAN	
<input type="checkbox"/> Temperature/Pressures	CHECK	
<input type="checkbox"/> Boost Pumps	OFF	(one at a time)
<input type="checkbox"/> Landing Lights	AS REQUIRED	

CRUISE		
<input type="checkbox"/> Throttles	SET	(press F2 and F3 as necessary)
<input type="checkbox"/> Propellers	SET	(press CTRL+F2 and CTRL+F3 as necessary)
<input type="checkbox"/> Mixtures	LEAN	(press CTRL+SHIFT+F2 and CTRL+SHIFT+F3 as necessary)
<input type="checkbox"/> Cowl Flaps	CLOSED	

DOUGLAS DC-3 PROCEDURES

DESCENT		
<input type="checkbox"/> Altimeters	SET	
<input type="checkbox"/> Fuel Quantity	CHECK	
<input type="checkbox"/> Fuel Valves	MAIN TANKS	
<input type="checkbox"/> Hydraulic Pressure	CHECK	
<input type="checkbox"/> Tail Wheel	LOCKED	
<input type="checkbox"/> Carb Heat	AS REQUIRED	(press H to toggle)
<input type="checkbox"/> Landing Lights	AS REQUIRED	

APPROACH		
<input type="checkbox"/> Mixtures	RICH	(press CTRL+SHIFT+F3 until fully forward)
<input type="checkbox"/> Boost Pumps	ON	
<input type="checkbox"/> Cowl Flaps	OPEN HALFWAY	
<input type="checkbox"/> Carb Heat	AS REQUIRED	(press H to toggle)

LANDING CHECK		
<input type="checkbox"/> Landing Gear	DOWN AND LOCKED	(press G to lower/raise)
<input type="checkbox"/> Wing Flaps	AS REQUIRED	(press F7 as necessary)
<input type="checkbox"/> Propellers	SET	(press CTRL+F2 and CTRL+F3 as necessary)

DOUGLAS DC-3 PROCEDURES

AFTER LANDING		
<input type="checkbox"/> Wing Flaps	UP AND NEUTRAL	(press F6 as necessary)
<input type="checkbox"/> Propellers	LOW RPM	(press CTRL+F2 until fully back)
<input type="checkbox"/> Cowl Flaps	OPEN	
<input type="checkbox"/> Pitot Heat	OFF	
<input type="checkbox"/> Carb Heat	OFF	(press H to toggle)
<input type="checkbox"/> Boost Pumps	OFF	
<input type="checkbox"/> Landing Lights	AS REQUIRED	
<input type="checkbox"/> Trim Tabs	NEUTRAL	(Set for Takeoff)
<input type="checkbox"/> Unnecessary Electrical	OFF	
<input type="checkbox"/> Tail Wheel	UNLOCKED FOR TAXI	

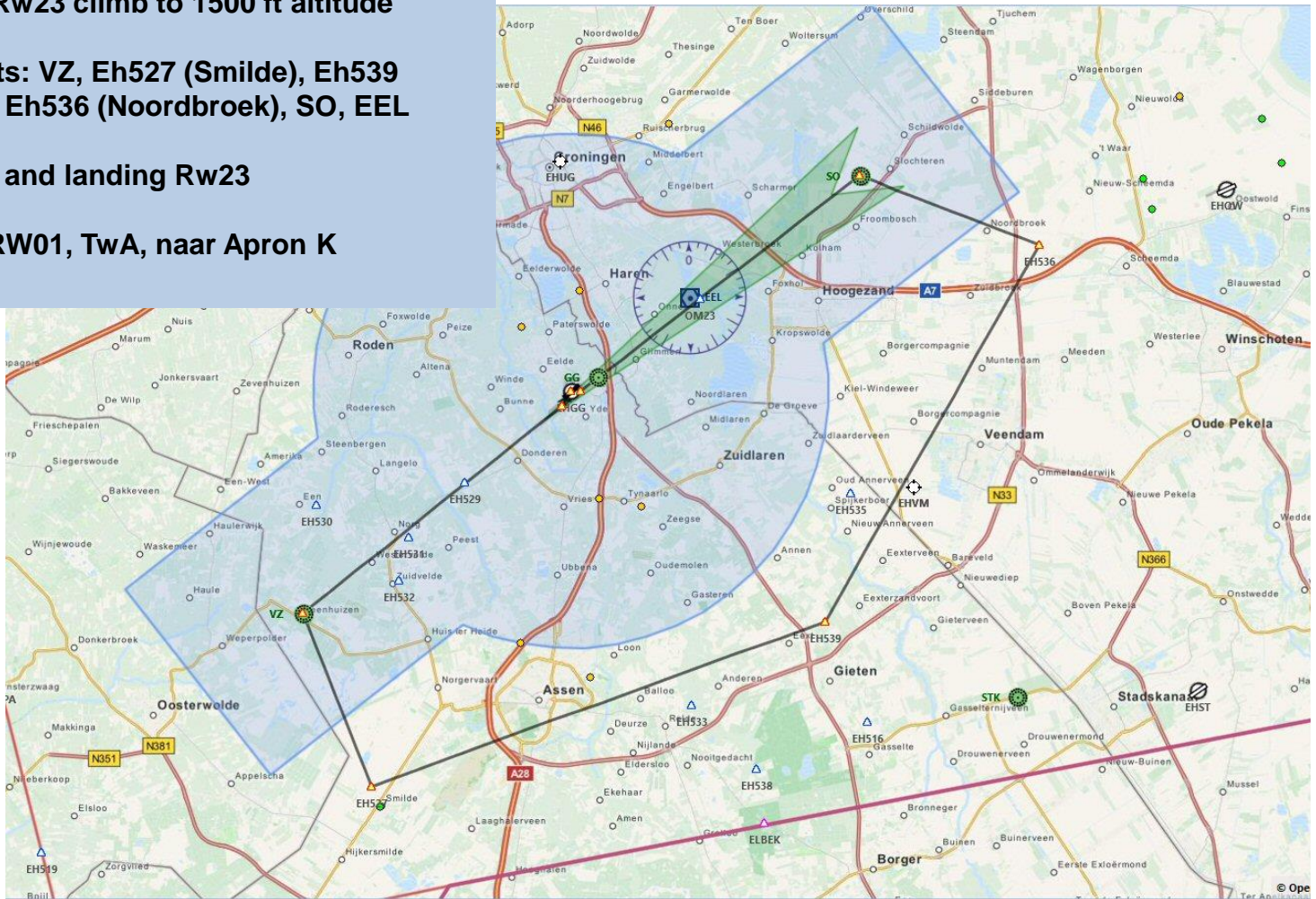
ENGINE SHUT-DOWN		
<input type="checkbox"/> Tail Wheel	LOCKED	
<input type="checkbox"/> Parking Brakes	SET	(press CTRL+PERIOD KEY)
<input type="checkbox"/> Radio Master	OFF	
<input type="checkbox"/> Mixtures	IDLE CUT-OFF	(press CTRL+SHIFT+F2 until fully back)
<input type="checkbox"/> Beacon	OFF	
<input type="checkbox"/> Navigation Lights	OFF	
<input type="checkbox"/> Magnetos	OFF	(press M+MINUS SIGN until Off)
<input type="checkbox"/> Flap and Gear Handles	SET	
<input type="checkbox"/> Brakes	RELEASED	(press PERIOD KEY)
<input type="checkbox"/> Master Battery	OFF	

DOUGLAS DC-3 PROCEDURES

ENGINE SHUT-DOWN		
<input type="checkbox"/> Tail Wheel	LOCKED	
<input type="checkbox"/> Parking Brakes	SET	(press CTRL+PERIOD KEY)
<input type="checkbox"/> Radio Master	OFF	
<input type="checkbox"/> Mixtures	IDLE CUT-OFF	(press CTRL+SHIFT+F2 until fully back)
<input type="checkbox"/> Beacon	OFF	
<input type="checkbox"/> Navigation Lights	OFF	
<input type="checkbox"/> Magnetos	OFF	(press M+MINUS SIGN until Off)
<input type="checkbox"/> Flap and Gear Handles	SET	
<input type="checkbox"/> Brakes	RELEASED	(press PERIOD KEY)
<input type="checkbox"/> Master Battery	OFF	

Vliegen met een DC3 Dakota

- ❑ start EHGG Gate A11
- ❑ taxi via TwA naar holding RW23
- ❑ take off Rw23 climb to 1500 ft altitude
- ❑ waypoints: VZ, Eh527 (Smilde), Eh539 (Gieten), Eh536 (Noordbroek), SO, EEL
- ❑ descent and landing Rw23
- ❑ taxi via RW01, TwA, naar Apron K



oefenvlucht vanaf eelde RW23

TAKEOFF AND CLIMB (at sea level)		
[.] Brakes	RELEASE	
[.] Mixtures	AUTO RICH	(press CTRL+SHIFT+F3 until fully forward)
[.] Throttles	52"Hg MANIFOLD PRESSURE	(press F2 and F3 as necessary)
[.] Propellers	2800 RPM	(press CTRL+F2 and CTRL+F3 as necessary)
[.] Landing Gear	RETRACT	(when positive rate of climb is established, press G)
--AT 105 KIAS--		
[.] Throttles	35"Hg MANIFOLD PRESSURE	(press F2 and F3 as necessary)
[.] Propellers	2400 RPM	(press CTRL+F2 and CTRL+F3 as necessary)
[.] Airspeed	MAINTAIN 105 KIAS	
--WHEN CLEAR OF OBSTACLES--		
[.] Airspeed	115-120 KIAS	

POWER 1830-94		
	MP	RPM
TAKEOFF	52	2800
METO	43½	2600
CLIMB	35½	2400
CRUISE	33	2050
	31	1850
IN RANGE	25	2000
FINAL	20	2000
MISSED	33	2300

opstijgen RW23 als aangegeven in checklist

na "straight and level" vliegen autopilot inschakelen en vliegplan volgen

landen RW23 volgens settings in linker tabel



Toetsenbord commando's voor FSX acties

FSX KEYBOARD COMMANDS



NOTE: MAKE SURE NUM LOCK IS OFF BEFORE USING NUM PAD COMMANDS.

TO ADD OR CUSTOMIZE KEYBOARD COMMANDS, ON THE OPTIONS MENU, POINT TO CONTROLS, THEN CLICK BUTTONS/KEYS. TO LEARN MORE, SEE THE USING THE KEYBOARD ARTICLE IN THE LEARNING CENTER

SIMULATOR

Pause	P or BREAK
Full Screen Mode	ALT + ENTER
Menus (display/hide)	ALT
ATC Menu (display/hide)	ACCENT or SCROLL LOCK
Kneebboard (display/hide)	SHIFT+F10
Sound (on/off)	Q
Reset Current Flight	CTRL+; (SEMICOLON)
Save Flight	; (SEMICOLON)
Exit Flight Simulator	CTRL+C
Exit Flight Simulator Immediately	CTRL+BREAK
Joystick (on/off)	CTRL+K
Cycle Coordinates/Frame Rate	SHIFT+Z
Select Item 1	1
Select Item 2	2
Select Item 3	3
Select Item 4	4
Select Time Compression	R
Drop Objects	SHIFT+D
Fuel Truck (request)	SHIFT+F
Aircraft Labels (display/hide)	CTRL+SHIFT+L
Flying Tips (display/hide)	CTRL+SHIFT+X
Increase Selection	= (EQUAL SIGN)
Increase Selection Slightly	SHIFT+= (EQUAL SIGN)
Decrease Selection Slightly	SHIFT+- (MINUS SIGN)
Decrease Selection	- (MINUS SIGN)
Capture Screenshot	V
Jetway (attach/detach)	CTRL+J
End Flight	ESC

CONTROL SURFACE

Ailerons (bank left)	Num Pad 4
Ailerons (bank right)	Num Pad 6
Aileron Trim (left)	CTRL+Num Pad 4
Aileron Trim (right)	CTRL+Num Pad 6
Rudder (yaw left)	Num Pad 0
Rudder (yaw right)	Num Pad ENTER
Rudder Trim (left)	CTRL+ Num Pad 0
Rudder Trim (right)	CTRL+Num Pad ENTER
Center Ailerons and Rudder	Num Pad 5
Pitch Down (elevator)	Num Pad 8
Pitch Up (elevator)	Num Pad 2
Elevator Trim Down	Num Pad 7
Elevator Trim Up	Num Pad 1
Flaps (retract fully)	F5
Flaps (retract incrementally)	F6
Flaps (extend incrementally)	F7
Flaps (extend fully)	F8
Extend/Retract Spoilers/Airbrakes	/ (FORWARD SLASH)
Arm Spoilers	SHIFT+ / (FORWARD SLASH)
Water Rudder Up/Down	CTRL+W

GENERAL

Brake (set parking)	CTRL+. (PERIOD)
Pushback (start/stop)	SHIFT+P (then press 1 or 2 to turn tail right/left)
Brakes (apply/release)	. (PERIOD)
Brakes (apply left brake)	Num Pad + (PLUS)
Brakes (apply right brake)	Num Pad - (MINUS)
Landing Gear (extend/retract)	G
Tail wheel (lock/unlock)	SHIFT+G
Landing Gear (extend manually)	CTRL+G
Fuel Dump (on/off)	CTRL+SHIFT+D
Subpanels (display/hide)	SHIFT + 1 through 9
Smoke System ((on/off))	I
Cowl Flaps (open incrementally)	CTRL+SHIFT+V
Cowl Flaps (close incrementally)	CTRL+SHIFT+C
Tow Plane (call)	CTRL+SHIFT+Y
Tow Rope (release)	SHIFT+Y
Doors (select)	SHIFT+E

ENGINE

On multiengine aircraft, engine commands affect all engines unless you first select an engine.

Select Engine	E+engine number (1-4)
Select All Engines	E+1+2+3+4
Engine Autostart	CTRL+E
Throttle (cut)	F1
Reverse Thrust (turboprops/jets)	F2 (press and hold)
Throttle (decrease)	F2 or Num Pad 3
Throttle (increase)	F3 or Num Pad 9
Throttle (full)	F4
Propeller (low RPM)	CTRL+F1
Propeller (decrease RPM)	CTRL+F2
Propeller (increase RPM)	CTRL+F3
Propeller (high RPM)	CTRL+F4
Mixture (idle cutoff)	CTRL+SHIFT+F1
Mixture (lean quickly)	CTRL+SHIFT+F2
Mixture (enrich)	CTRL+SHIFT+F3
Mixture (full rich)	CTRL+SHIFT+F4
Carb Heat/Engine Anti-ice ((on/off))	H
Magnetos (select)	M
Master Battery/Alternator (select)	SHIFT+M
Jet Starter (select)	J
Helicopter Rotor Clutch ((on/off))	SHIFT+. (PERIOD)
Helicopter Rotor Governor ((on/off))	SHIFT+, (COMMA)
Helicopter Rotor Brake ((on/off))	SHIFT+B
Increase Selection	= (EQUAL SIGN)
Increase Selection Slightly	SHIFT+= (EQUAL SIGN)
Decrease Selection Slightly	SHIFT+- (MINUS SIGN)
Decrease Selection	- (MINUS SIGN)

MISSION COMMANDS

Compass/Pointer (on/off)	U
Compass Objective (next)	K
Compass Objective (previous)	SHIFT+K

LIGHTS

Lights - all (on/off)	L
Strobe Lights (on/off)	O
Panel Lights (on/off)	SHIFT+L
Landing Lights (on/off)	CTRL+L
Landing Light (tilt down)	CTRL+SHIFT+Num Pad 2
Landing Light (tilt left)	CTRL+SHIFT+Num Pad 4
Landing Light (tilt right)	CTRL+SHIFT+Num Pad 6
Landing Light (tilt up)	CTRL+SHIFT+Num Pad 8
Landing Light (center)	CTRL+SHIFT+Num Pad 5

RADIO

ATC Window (display/hide)	ACCENT or SCROLL LOCK
VOR 1 Ident (on/off)	CTRL+1
VOR 2 Ident (on/off)	CTRL+2
MKR Ident (on/off)	CTRL+3
DME Ident (on/off)	CTRL+4
ADF Ident (on/off)	CTRL+5
Standby Frequency (swap)	X
COM Radio (select)	C
NAV Radio (select)	N
OBS indicator (select)	SHIFT+V
ADF (select)	CTRL+SHIFT+A
DME (select)	F
Transponder (select)	T
Increase Selection	= (EQUAL SIGN)
Increase Selection Slightly	SHIFT+= (EQUAL SIGN)
Decrease Selection Slightly	SHIFT+- (MINUS SIGN)
Decrease Selection	- (MINUS SIGN)

AUTOPILOT

Master (on/off)	Z
Flight Director (on/off)	CTRL+F
Wing Leveler (on/off)	CTRL+V
Yaw Damper (on/off)	CTRL+D
Altitude Hold (on/off)	CTRL+ Z
Altitude Bug (select)	CTRL+SHIFT+Z
Heading Hold (on/off)	CTRL+H
Heading Bug (select)	CTRL+SHIFT+H
Airspeed Hold (on/off)	CTRL+R
Mach Hold (on/off)	CTRL+M
Autothrottle (arm)	SHIFT+R
Autothrottle engage (TOGA)	CTRL+SHIFT+G
Nav 1 Hold (on/off)	CTRL+N
Approach Mode (on/off)	CTRL+A
Back Course Mode (on/off)	CTRL+B
Localizer Hold (on/off)	CTRL+O
Attitude Hold (on/off)	CTRL+T
Increase Selection	= (EQUAL SIGN)
Increase Selection Slightly	SHIFT+= (EQUAL SIGN)
Decrease Selection Slightly	SHIFT+- (MINUS SIGN)
Decrease Selection	- (MINUS SIGN)

INSTRUMENTS

Heading Indicator (reset)	D
Altimeter (reset)	B
Pitot Heat (on/off)	SHIFT+H
Increase Selection	= (EQUAL SIGN)
Increase Selection Slightly	SHIFT+= (EQUAL SIGN)
Decrease Selection Slightly	SHIFT+- (MINUS SIGN)
Decrease Selection	- (MINUS SIGN)

VIEWS

2-D Cockpit (cycle panels)	W
Snap to Panel View	SHIFT+Num Pad 0
View (next category)	S
View (previous category)	SHIFT+S
View (next view in category)	A
View (previous view in category)	SHIFT+A
View (previous view toggle)	CTRL+S
View (default zoom)	BACKSPACE
Look (snap)	Num Pad
Look (pan)	Hat switch or thumbstick
Look (reset to forward view)	SHIFT+Num Pad DEL
Look Using Mouse (on)	Hold SPACEBAR
Look Using Mouse (on/off)	SHIFT+O
View (open new window)	[(LEFT BRACKET)
View (close selected window)] (RIGHT BRACKET)
View (open new top-down window)	SHIFT+] (RIGHT BRACKET)
Virtual Cockpit	F9
2-D Cockpit	F10
Locked Spot View	F11
Top-Down View	F12
2-D Panel Transparency	CTRL+SHIFT+T (+ or -)
Window (bring selected to front)	' (APOSTROPHE)
Zoom In	= (EQUAL SIGN)
Zoom Out	- (HYPHEN)
View (next window)	CTRL+TAB
View (previous window)	CTRL+SHIFT+TAB
Eye point (move back)	SHIFT+ENTER
Eye point (move down)	CTRL+BACKSPACE
Eye point (move forward)	CTRL+BACKSPACE
Eye point (move left)	CTRL+SHIFT+BACKSPACE
Eye point (move right)	CTRL+SHIFT+ENTER
Eye point (move up)	SHIFT+ENTER
Eye point (reset)	CTRL+SPACE

MULTIPLAYER

Chat Window (display/hide)	CTRL+SHIFT+]
Chat Window (make active)	ENTER
Voice (start transmit)	CAPS LOCK
Voice (stop transmit)	^CAPS LOCK
Voice (start transmit to all)	SHIFT+CAPS LOCK
Voice (stop transmit to all)	^SHIFT+CAPS LOCK
Transfer/Accept Control	SHIFT+T
Follow Other Player	CTRL+SHIFT+F