

Airplanes



Airplane Timeline

- 1901 First Successful Flying model using internal combustion engine
 - Samuel Langley
- 1903 First sustained powered flight
 - Wright Brothers
- 1904 Concept of fixed boundary layer
 - Ludwig Prandtl



Airplane Timeline

- 1910 First takeoff from a ship
- 1914 Automatic gyrostabilizer leads to first automatic pilot
- 1915 National Advisory Committee for Aeronautics

Airplane Timeline

- 1917 Junkers J4, all metal airplane
- 1918 Airmail service started
- 1919 Navy aviators cross North Atlantic
- 1919 Passenger service across English Channel



Airplane Timeline

- 1927 Charles Lindbergh first solo nonstop crossing of the Atlantic (NY to Paris)
- 1928 First electromechanical flight simulator
- 1922 Douglas introduces 12 passenger DC-1



Airplane Timeline

- 1933 Boeing introduces the 247, first commercial airliner
- 1935 First radar
- 1935 Trans pacific mail service
- 1937 Jet engine designed



Airplane Timeline



RADIO SET AN/MRN-1 TOTAL WEIGHT 16,900 LBS.



- 1939-1945 WWII spurs innovation



Airplane Timeline

- 1947 Sound barrier broken
- 1949 First commercial jet aircraft, Comet
- 1952 Discovery of the area rule, Richard Whitcomb
- 1963 First small jets enter mass production, Learjet



Airplane Timeline

- 1969 Boeing 747
- 1976 Concorde SST
- 1986 Voyager, Dec 23



Airplane Timeline

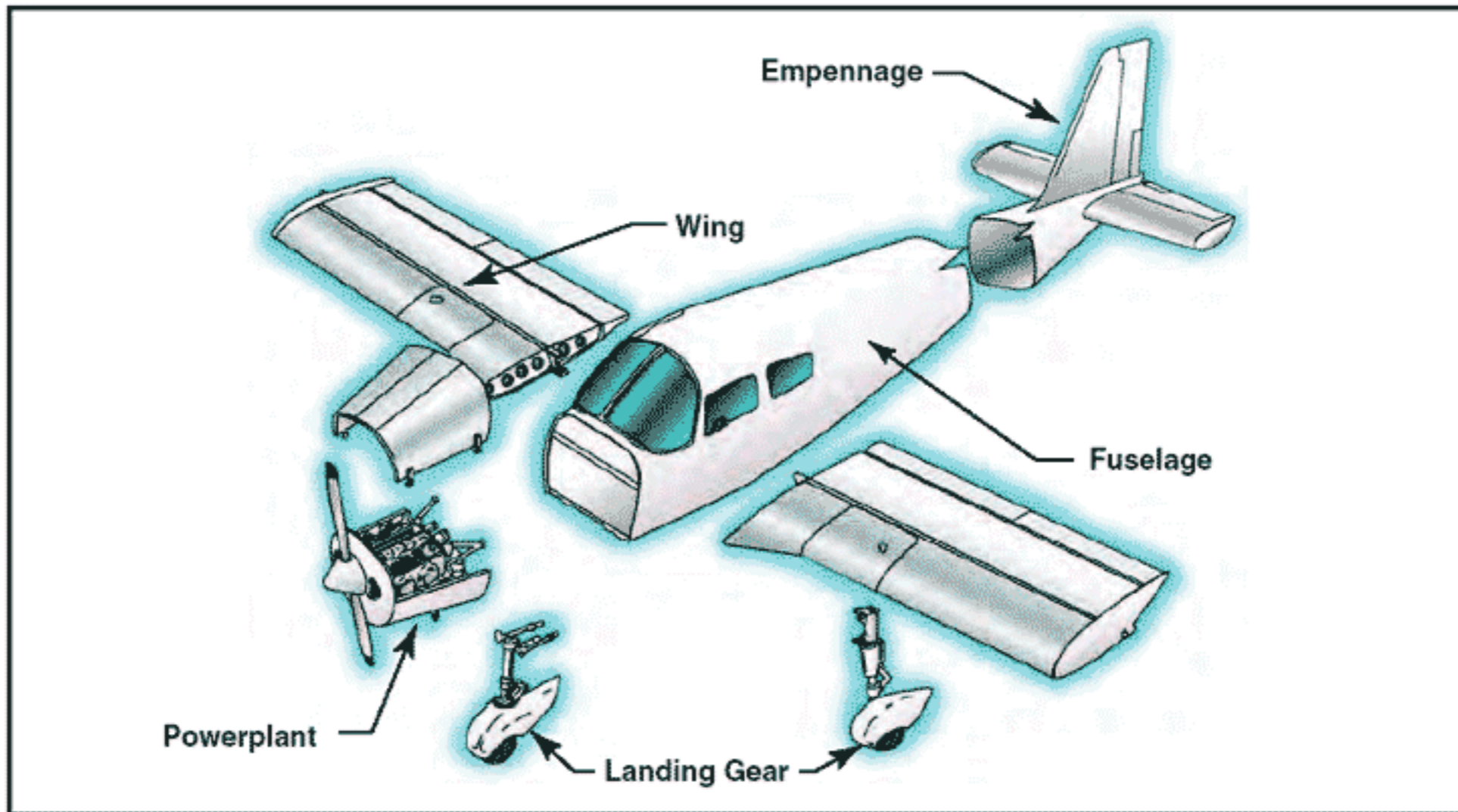
- 1990 B2 Bomber Developed
- 1995 777 Developed through computer aided design
- 2003 100 years of powered Flight







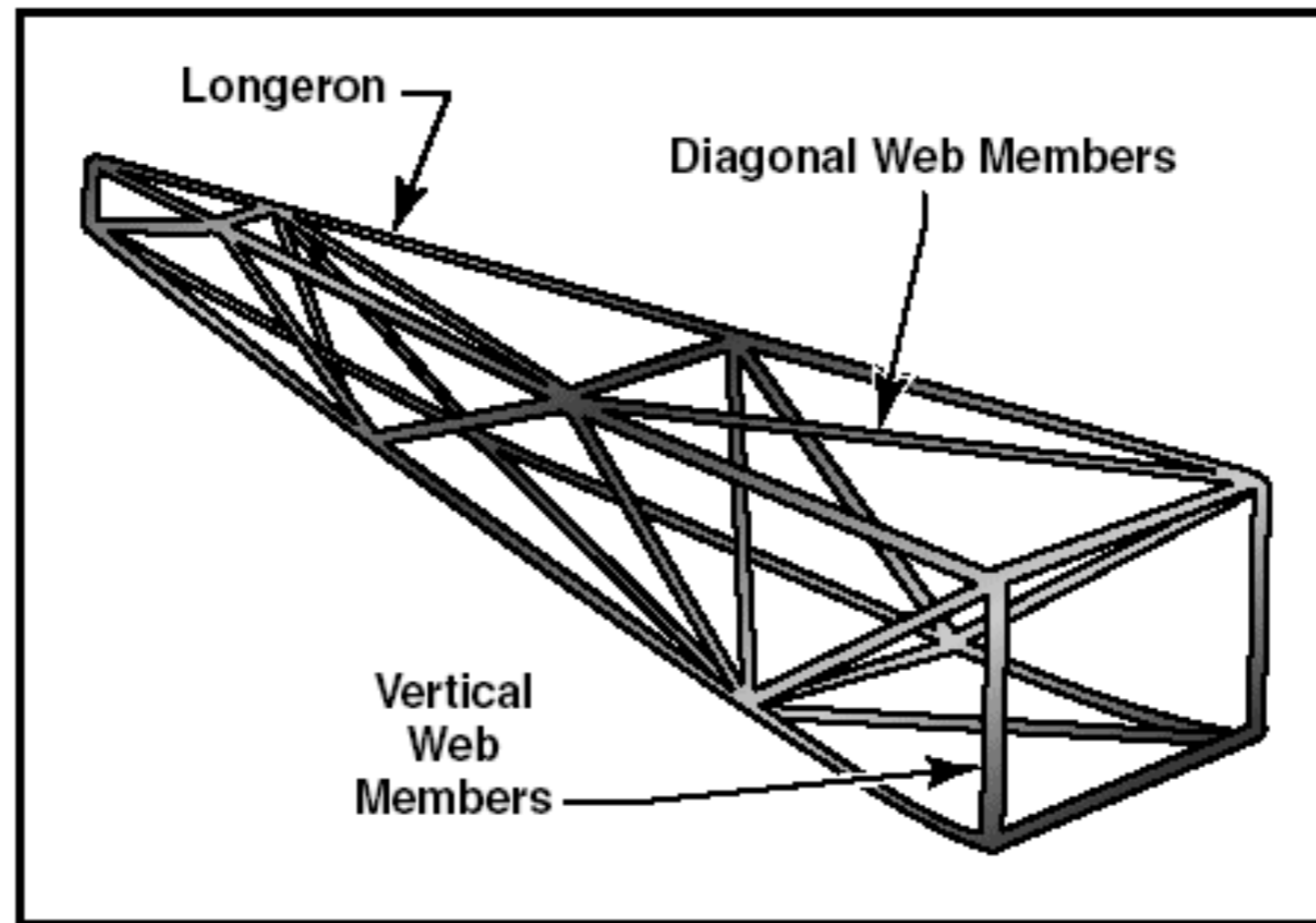
Parts of an Airplane



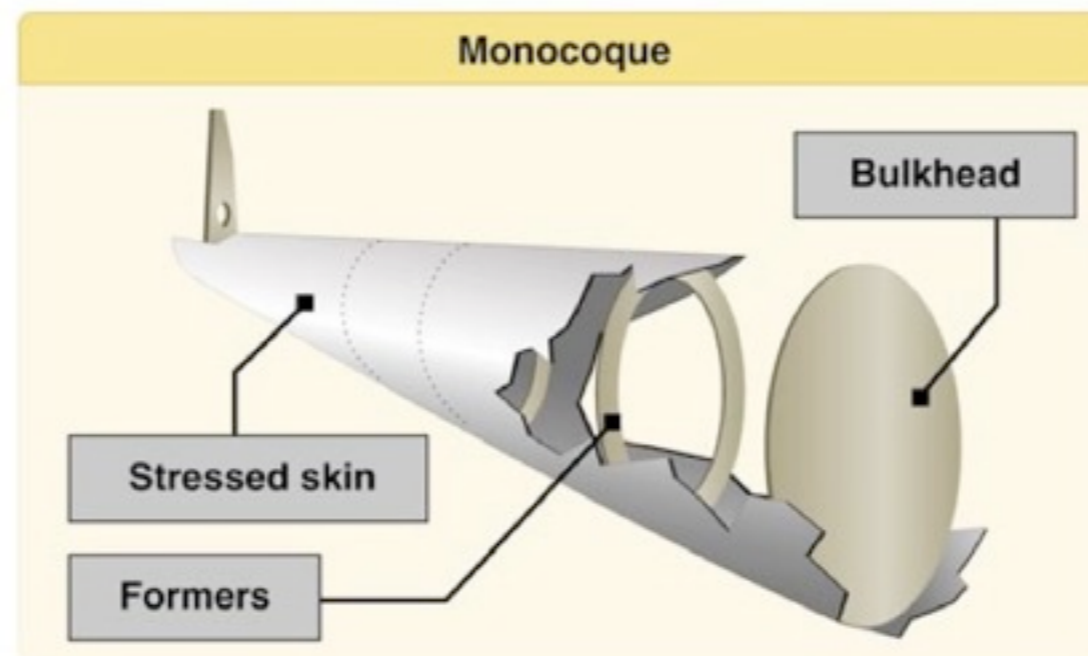
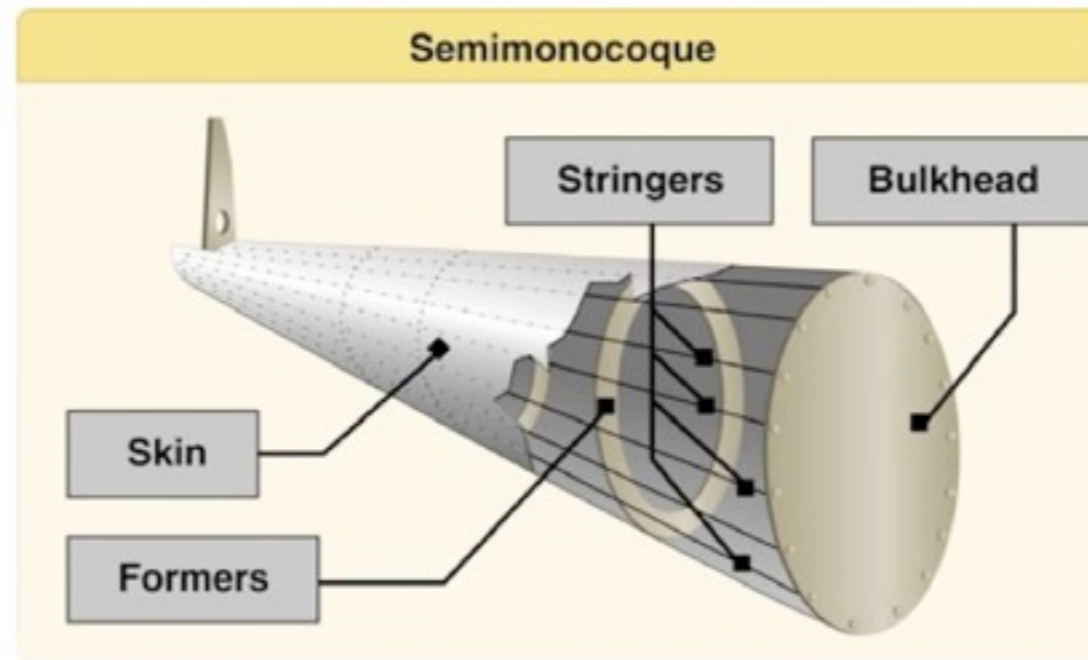
The Fuselage

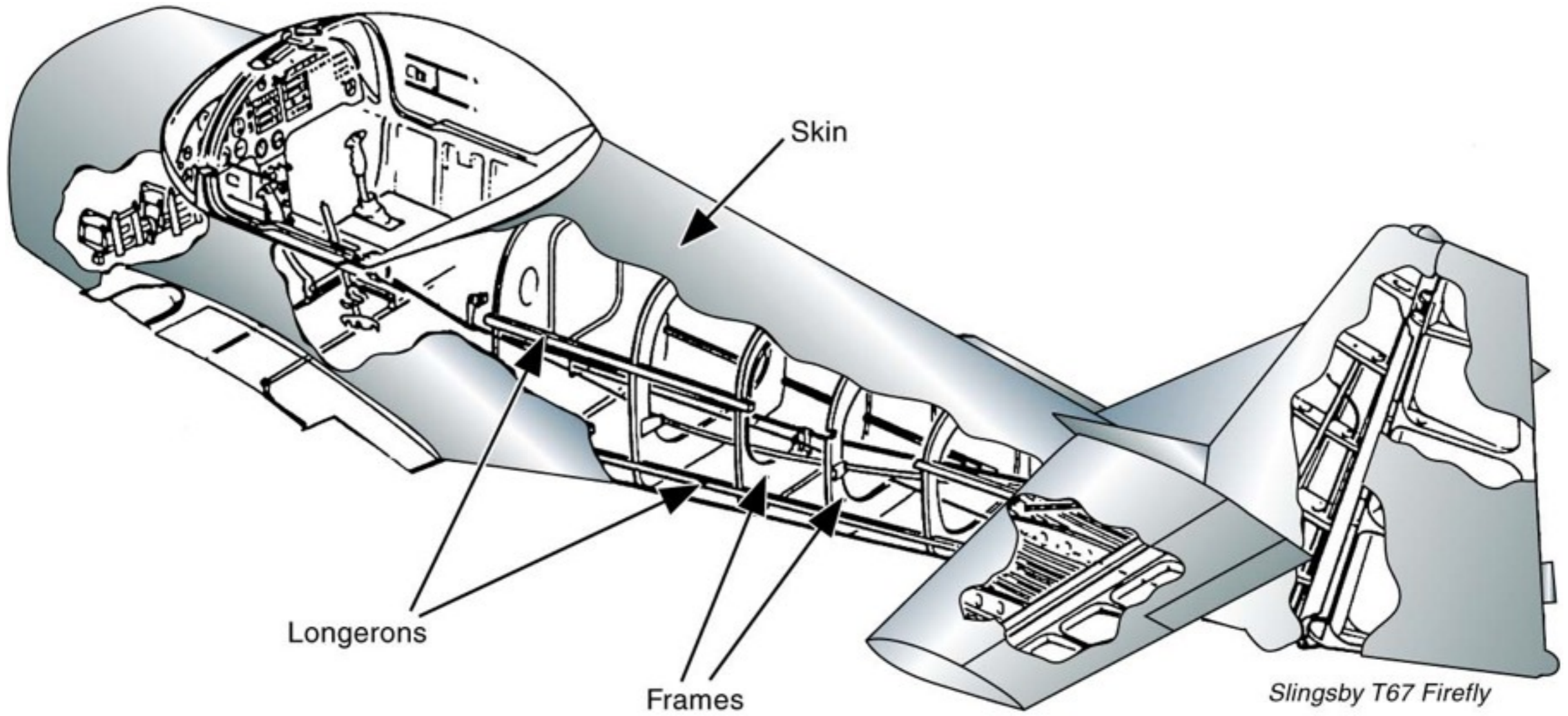


Truss Type Construction



Construction Techniques



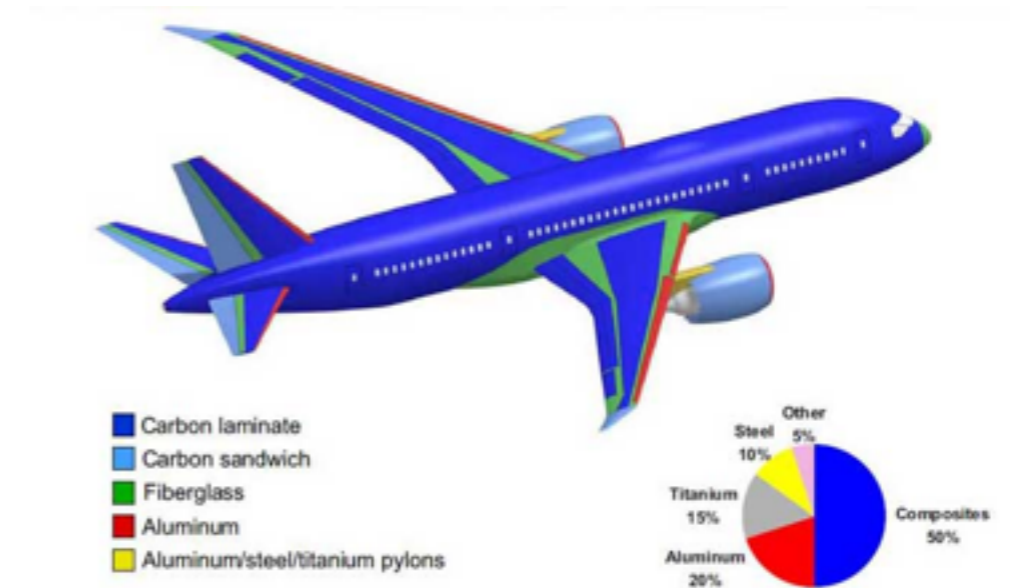


Composite

- Light Weight
- Carbon Fiber
- Aerodynamic
- Proof of Damage

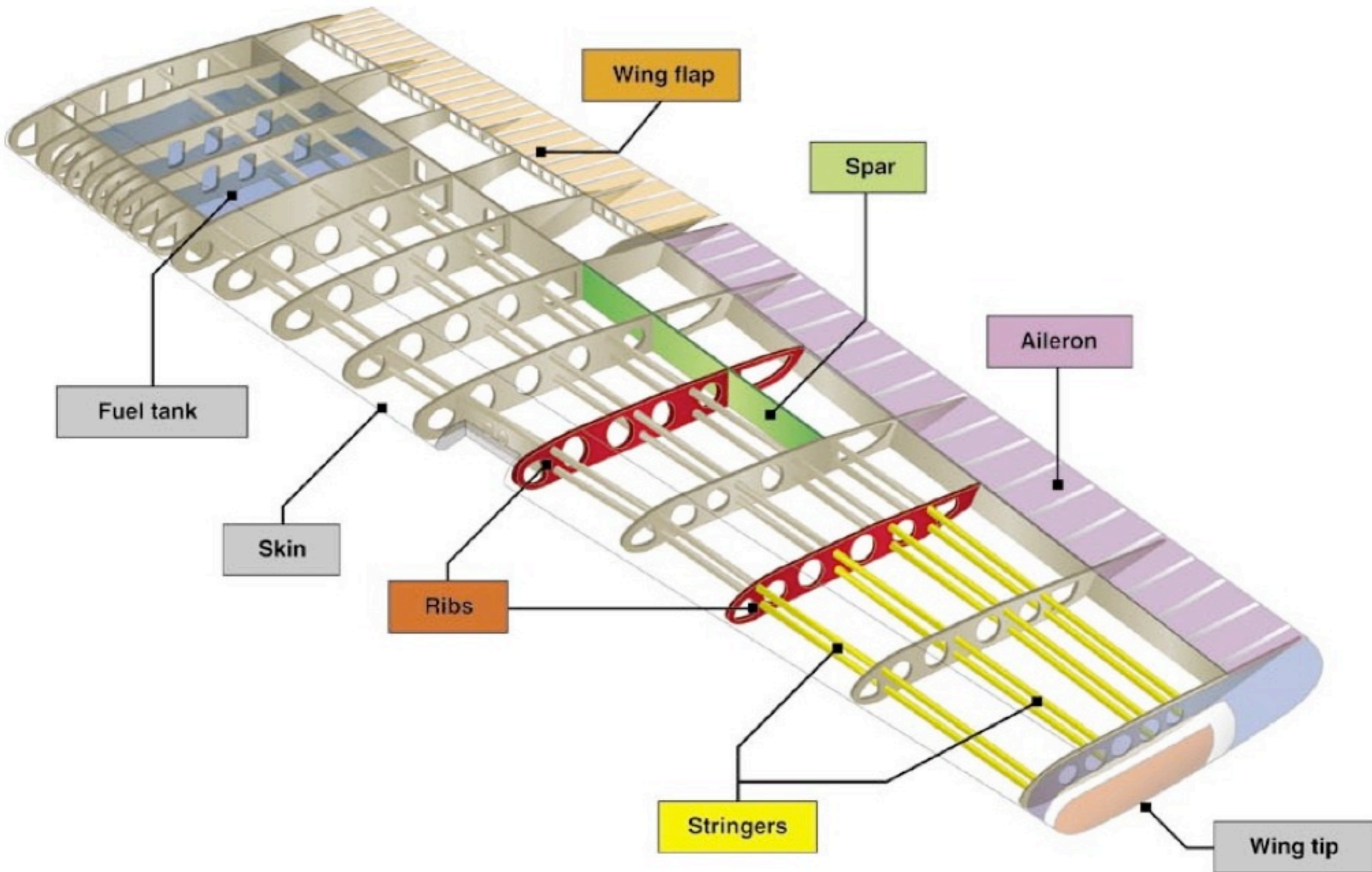


Advanced Composites



Wings

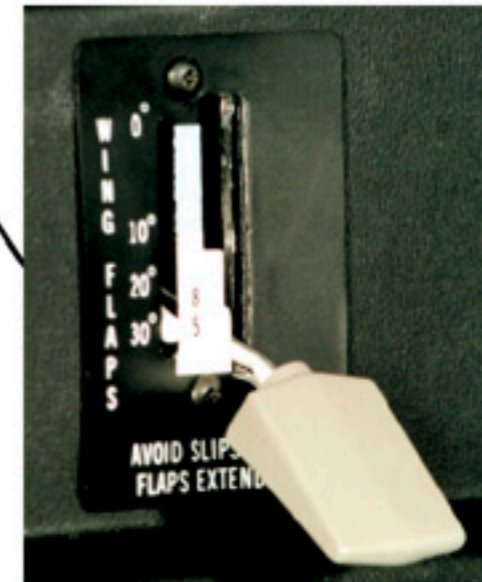




Flap



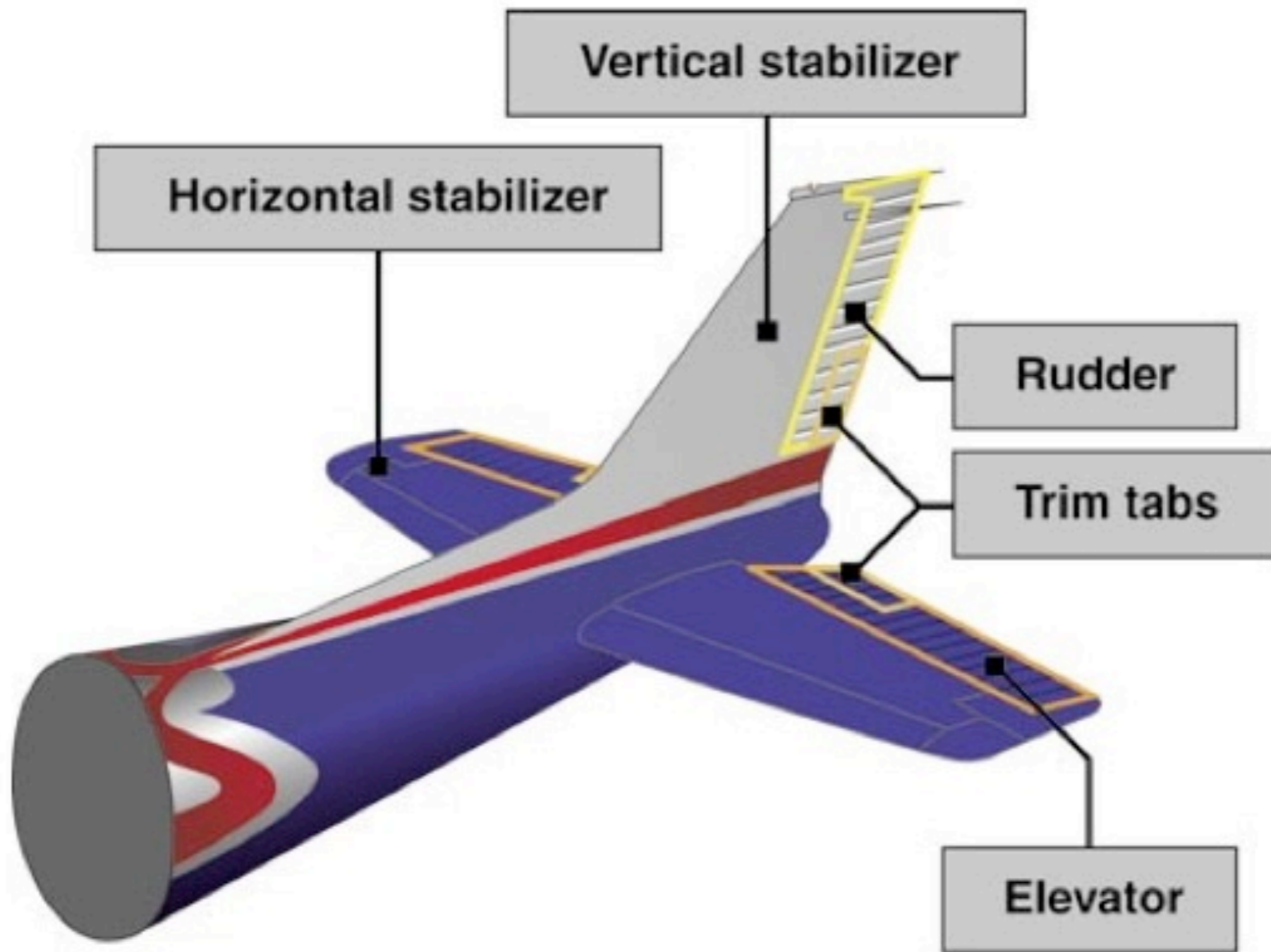
Aileron

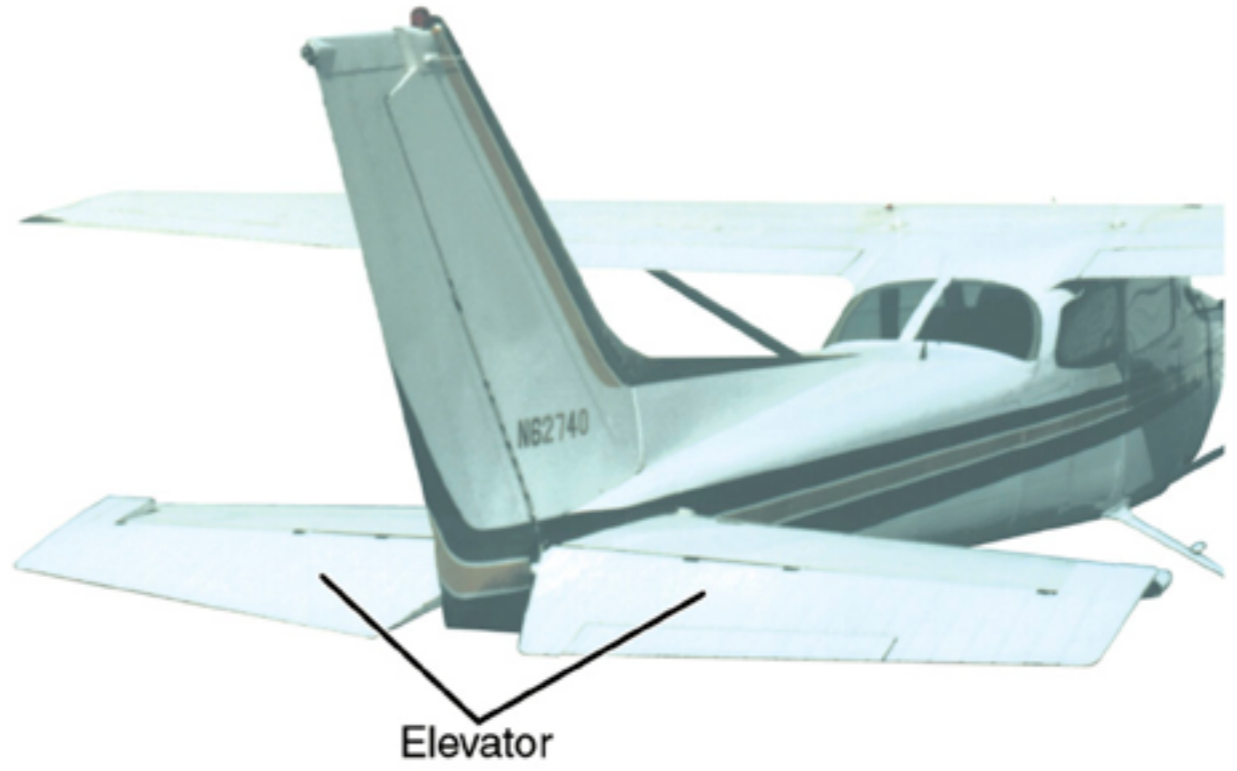




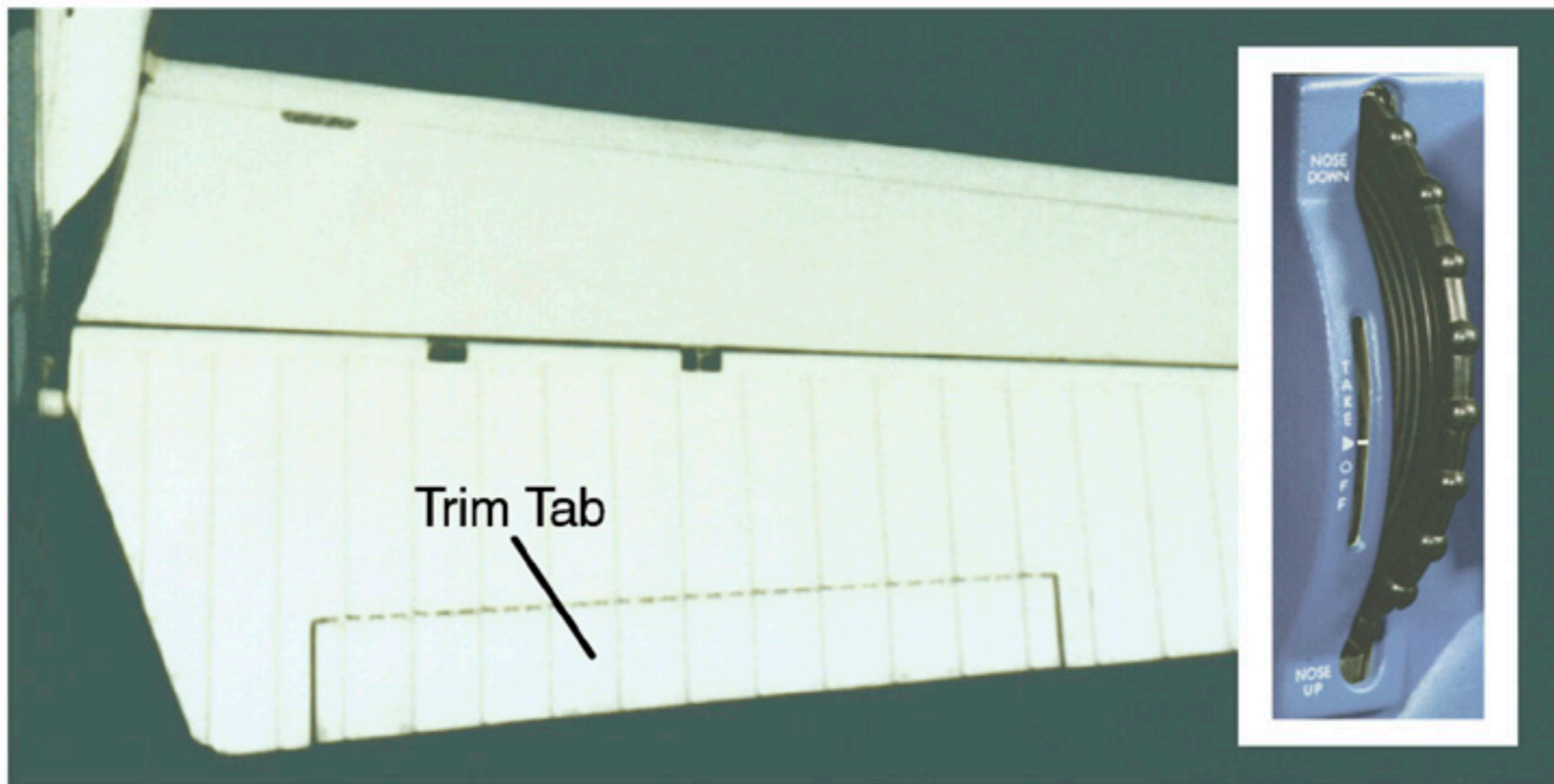
The Empennage







Trim Devices



Landing Gear



Fixed/Conventional



Retractable

Extreme Landing Gear



More Landing Gear

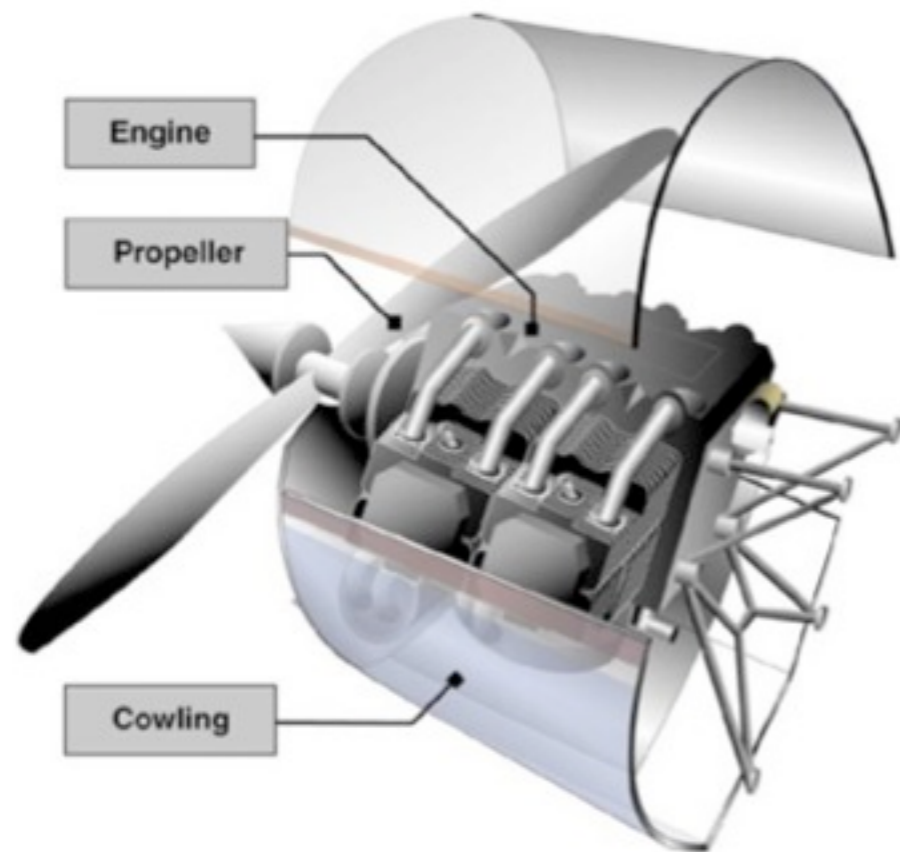


Floats



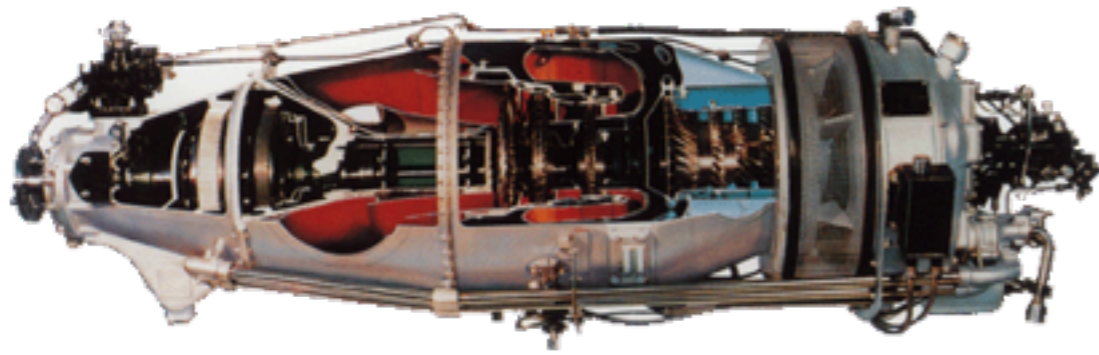
Skis

Powerplant (Engine)



Reciprocating Engine

More Powerplants



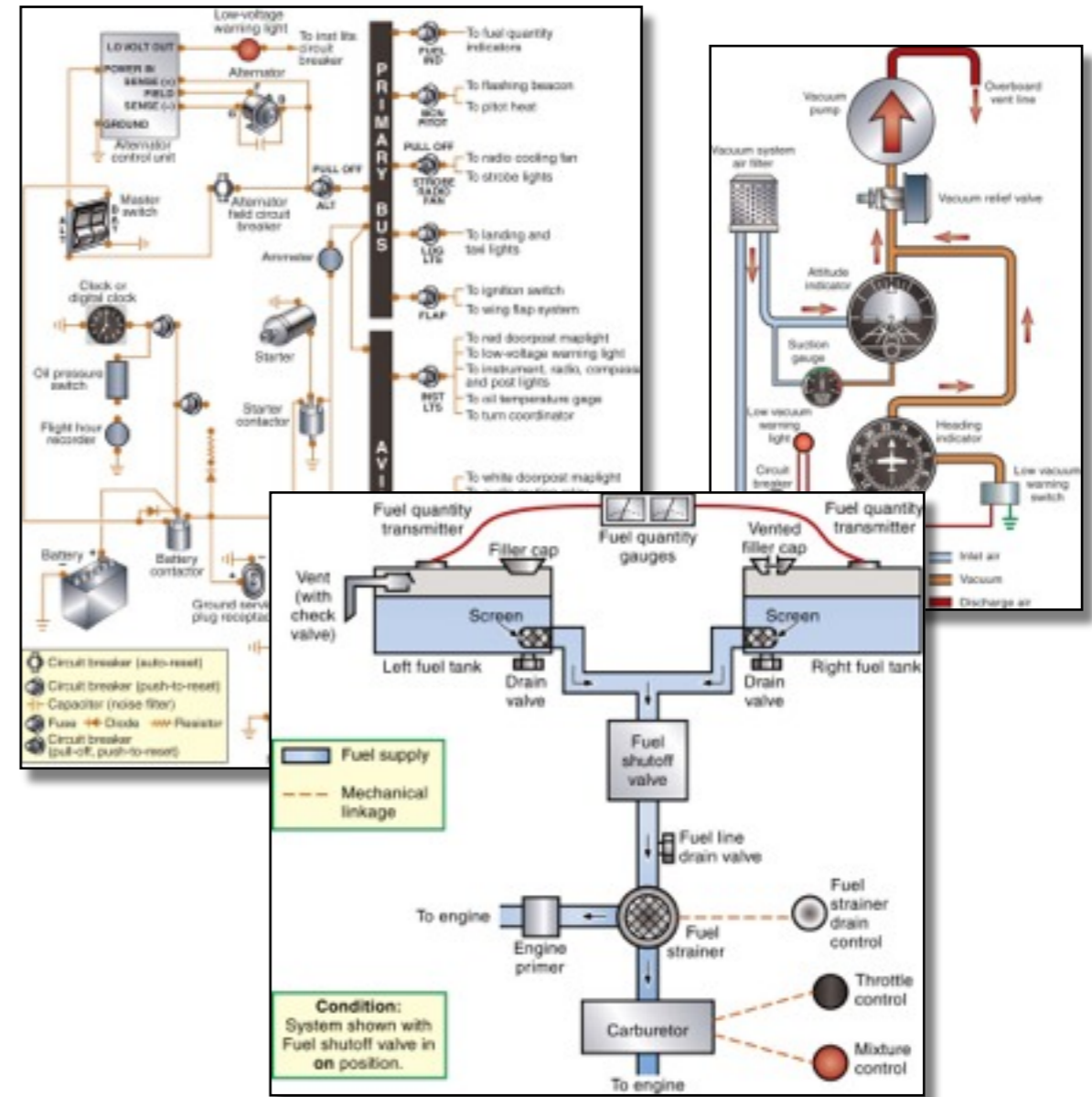
PT6



Turbine Engine

Aircraft Systems

- Flight Controls
- Electrical System
- Fuel System
- Vacuum System



Cockpit



Controls and Instruments



Instruments

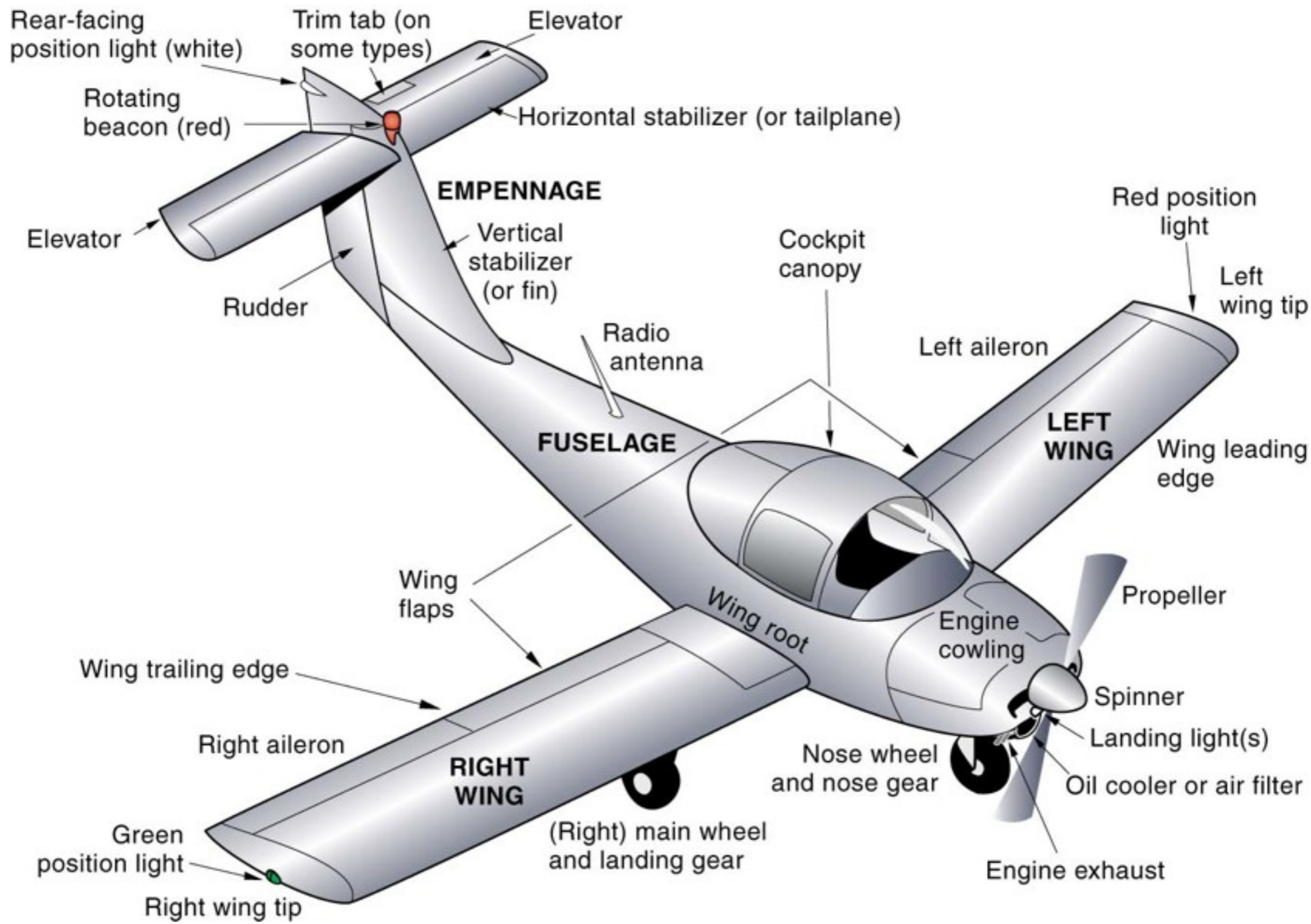


Advanced Instruments

Review

- Fuselage
- Wings
- Empennage
- Landing Gear
- Cockpit
- Instruments





Airworthiness Requirements

- A pilot is responsible for verifying airworthiness of an aircraft as part of the preflight and planning actions



Required Documents (ARROW)

- Airworthiness Certificate
- Registration Certificate
- Radio Station License
 - Only required when transmitting to foreign ground stations
- Operating Limitations
 - Fulfilled via placards and the Pilot Operating Handbook
- Weight and Balance Data
 - Typically contained in the Pilot Operating Handbook as well

Airworthiness Certificate

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION—FEDERAL AVIATION ADMINISTRATION
STANDARD AIRWORTHINESS CERTIFICATE

1. NATIONALITY AND REGISTRATION MARKS N9070U	2. MANUFACTURER AND MODEL Boeing 737-222	3. AIRCRAFT SERIAL NUMBER 19951	4. CATEGORY Transport
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5. AUTHORITY AND BASIS FOR ISSUANCE
This airworthiness certificate is issued pursuant to the Federal Aviation Act of 1958 and certifies that, as of the date of issuance, the aircraft to which issued has been inspected and found to conform to the type certificate therefor, to be in condition for safe operation, and has been shown to meet the requirements of the applicable comprehensive and detailed airworthiness code as provided by Annex 8 to the Convention on International Civil Aviation, except as noted herein.

Exceptions: Exemption from FAR 25.1001 - allow takeoff weight 115% of maximum landing weight. Exemption from FAR No. 575 - Exemption from

6. TERMS AND CONDITIONS
Unless sooner surrendered, suspended, revoked, or a termination date is otherwise established by the Administrator, this airworthiness certificate is effective as long as the registration, preventative maintenance, and alterations are performed in accordance with Parts 43, and 91 of the Federal Aviation Regulations, as appropriate, and the aircraft is registered in the United States.

DATE OF ISSUANCE 8-27-69 "Replacement"	FAA REPRESENTATIVE F. G. FELL	DESIGNATION NUMBER DMIR No. 4032
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Any alteration, reproduction, or misuse of this certificate may be punishable by a fine not exceeding \$1,000, or imprisonment not exceeding 3 years, or both. THIS CERTIFICATE MUST BE DISPLAYED IN THE AIRCRAFT IN ACCORDANCE WITH APPLICABLE FEDERAL AVIATION REGULATIONS.

Registration Certificate

- Valid 7 years

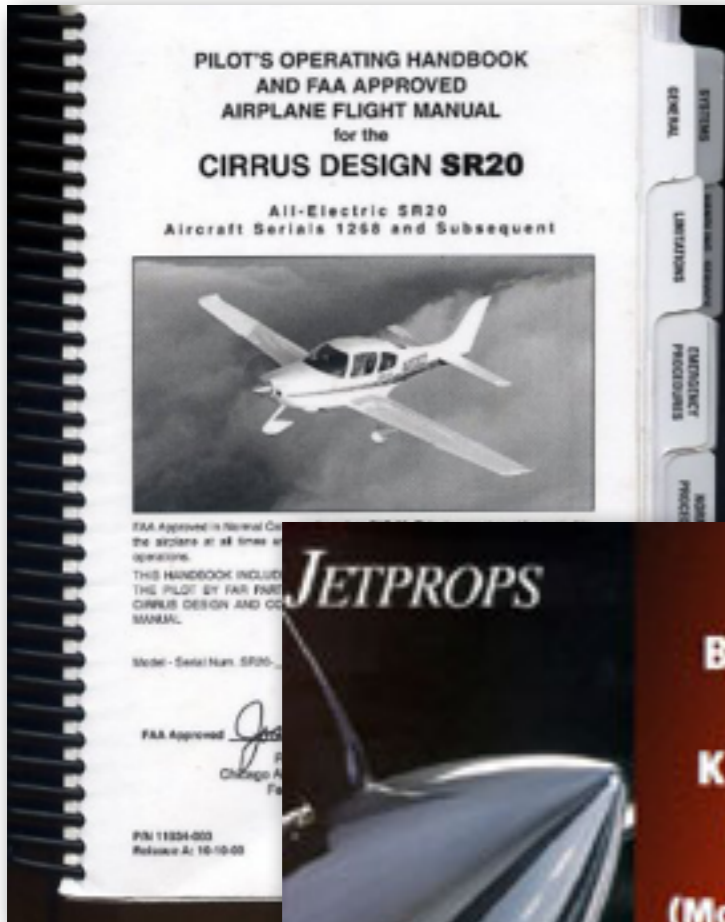
REGISTRATION NOT TRANSFERABLE		
UNITED STATES OF AMERICA DEPARTMENT OF TRANSPORTATION - FEDERAL AVIATION ADMINISTRATION CERTIFICATE OF AIRCRAFT REGISTRATION		This certificate must be in aircraft when operated.
NATIONALITY AND REGISTRATION MARKS	N 12345	AIRCRAFT SERIAL NO. 6969
MANUFACTURER AND MANUFACTURER'S DESIGNATION OF AIRCRAFT CESSNA C-150L ICAO Aircraft Address Code:		
I S S U E D T O	ROBERT E. BARO 300 MOERKLE ST ANYTOWN, OHIO 12345	This certificate is issued for registration purposes only and is not a certificate of title. The Federal Aviation Administration does not determine rights of ownership as between private persons.
	It is certified that the above described aircraft has been entered on the register of the Federal Aviation Administration, United States of America, in accordance with the Convention on International Civil Aviation dated December 7, 1944, and with the Federal Aviation Act of 1958, and regulations issued thereunder.	
DATE OF ISSUE February 15, 1996	<i>David Hinson</i> ADMINISTRATOR	
 U.S. Department of Transportation Federal Aviation Administration		
AC Form 8050-3(11/93) Supersedes previous editions		

Weight and Balance Data Sheet Example

Aircraft Weight and Balance Revision

Tail Number: N60457		Date: 7/3/2006	
Prepared by: BURLINGTON AVIATION 3441 N. AVIATION DR. BURLINGTON, NC 2		Work Order No:	
		Type Certificate Data No: 3A12	
Aircraft Make: CESSNA	Model: 172S	Serial No: 172S10212	Time: 16.3
Registered Owner: CLEAR DAY AVIATION, INC.		Address: 3441 N. AVIATION DR BURLINGTON, NC 27215	
Maximum Weight 2558.0		CG Range FWD AFT	
As Received; Date of Previous Weight and Balance: 5/19/2006	Useful Load: 800.9	EW: 1757.1	EWCG: 41.66 Moment: 73204.00
Notes:			
	Weight	Arm	Moment
REMOVED WHEEL FAIRINGS	-16.5	46.1	-760.65
	0.00	0.00	0.00
	0.00	0.00	0.00
	0.00	0.00	0.00
	0.00	0.00	0.00
	0.00	0.00	0.00
	0.00	0.00	0.00
	0.00	0.00	0.00
	0.00	0.00	0.00
	0.00	0.00	0.00
	0.00	0.00	0.00
<input checked="" type="checkbox"/> As Calculated	Moment 72443.35	New Empty Weight CG	New Useful Load
As Weighed	Weight 1740.60	41.62	817.40
Signature HAROLD D. HUMPHRIES			
Repair Agency or License No: A&P2778241A			

Pilot Operating Handbook (POH)



JETPROPS

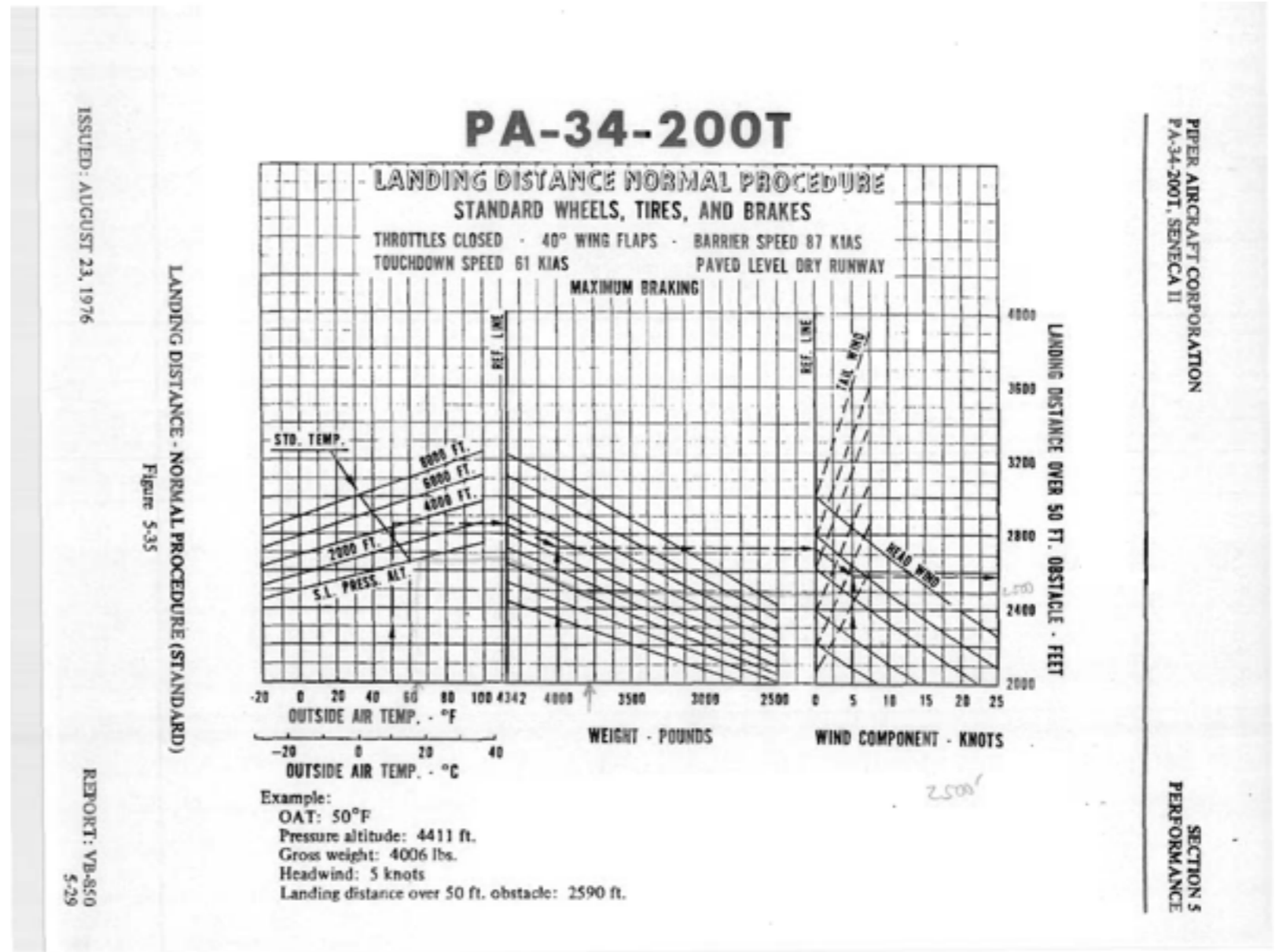
Beech

King Air C90B
(Model C90A)

(Serials LJ-1353 and after, except LJ-1367, LJ-1373, LJ-1377, LJ-1384, LJ-1386, LJ-1389, LJ-1394, LJ-1397, LJ-1400, LJ-1411, LJ-1425, LJ-1427, LJ-1498, and LJ-1538)

POH / AFM

90-590024-6983



Required Maintenance and Inspections (AAV1ATE)

- Airworthiness Directives as required
- Annual Inspection every 12 calendar months
- VOR Check every 30 days
 - Instrument Flight Rules Only
- 100 Hour Inspection
 - Aircraft used in commercial operations
- Altimeter and Static System every 24 calendar months
- Transponder every 24 calendar months
 - Fulfilled via placards and the Pilot Operating Handbook
- ELT every 12 calendar months, after 1 hour of continuous use, or 50% of useful battery life

Airworthiness Directive

- Issued by the FAA
- Think of a recall for cars, but typically aircraft owners/operators need to pay out of pocket rather than the manufacturer
- Can be a one-time fix for a defect, recurring maintenance/inspections, or additional limitations on aircraft operations
- 2 Categories
 - Emergency
 - Aircraft grounded immediately until airworthiness directive is resolved
 - Standard
 - Compliance within a specified timeframe

Airworthiness Directive Example

(a) Effective Date

This airworthiness directive (AD) is effective July 15, 2021.

(b) Affected ADs

This AD replaces AD 79-01-03, Amendment 39-3383 (44 FR 36, January 2, 1979) (AD 79-01-03); and AD 83-20-03, Amendment 39-4739 (48 FR 45535, October 6, 1983) (AD 83-20-03).

(c) Applicability

This AD applies to Piper Aircraft, Inc. Models PA-36-285, PA-36-300, and PA-36-375 airplanes, certificated in any category.

(d) Subject

Joint Aircraft System Component (JASC) Code 5700, Wings.

(e) Unsafe Condition

This AD was prompted by a review of AD 83-20-03 and AD 79-01-03 and the determination that the requirements of those ADs did not address all of the affected airplanes. The FAA is issuing this AD to prevent fatigue damage to the wing structural components. The unsafe condition, if not addressed, could result in failure of the wing structure with consequent loss of control.

(f) Compliance

Comply with this AD within the compliance times specified, unless already done.

(g) Inspection of the Wing Spar Carry Through Assembly

(1) For Models PA-36-285 and PA-36-300 airplanes, serial numbers 36-7360001 through 36-7560003, with a wing spar carry through assembly part number (P/N) 97370-00 installed, before the airplane accumulates a total of 2,000 hours time-in-service (TIS) or within 25 hours TIS after the effective date of this AD, whichever occurs later, and thereafter at intervals not to exceed 100 hours TIS, inspect the wing spar carry through assembly by following the Instructions, section 1, of Piper Service Bulletin No. 552A, dated August 3, 2018, (Piper SB No. 552A).

Preventative Maintenance (FAR 43.7)

- Replacing/Servicing batteries
- Replacing spark plugs
- Servicing wheel bearings/struts
- Adding air to tires
- Adding oil
- ETC.
- When in doubt, check FAR 43.7 or consult an A&P

FAR 91.205 Required Aircraft Equipment

VFR DAY

- A- AIRSPEED INDICATOR**
- T- TACHOMETER**
- O- OIL PRESSURE GAUGE (ONE FOR EACH ENGINE)**
- M- MANIFOLD PRESSURE GAUGE**
- A- ALTIMETER**
- T- TEMPERATURE GAUGE (ONE FOR EACH LIQUID COOLED ENGINE)**
- O- OIL TEMPERATURE GAUGE (ONE FOR EACH ENGINE)**

- F- FUEL GAUGE**
- L- LANDING GEAR INDICATOR (IF APPLICABLE)**
- A- ANTI-COLLISION LIGHTS**
- M- MAGNETIC COMPASS**
- E- ELT (EMERGENCY LOCATION TRANSMITTER)**
- S- SAFETY BELTS**

VFR NIGHT

ADD THE ACRONYM 'FLAPS'

- F- FUSES**
- L- LANDING LIGHT**
- A- ANTI-COLLISION LIGHTS**
- P- POSITION LIGHTS**
- S- SOURCE OF POWER**

A-TOMATO-FLAMES

ANGLE OF ATTACK.

Minimum Equipment List

U.S. DEPARTMENT OF TRANSPORTATION		MASTER MINIMUM EQUIPMENT LIST			
FEDERAL AVIATION ADMINISTRATION					
AIRCRAFT: EMB-500		REVISION NO: 2 DATE: 05/06/2011		PAGE NO: 21-3	
1. SYSTEM, SEQUENCE NUMBERS & ITEM	REPAIR CATEGORY	2. NUMBER INSTALLED		3. NUMBER REQUIRED FOR DISPATCH	
					4. REMARKS AND EXCEPTIONS
21 AIR CONDITIONING					
31-00 Cabin Pressure Control System (Continued)					
3) Cabin Pressure Parameters (Altitude, Rate, Delta-P) Indication	C	1	0		(O) May be inoperative provided flight is conducted unpressurized at or below 10,000 feet MSL.
4) Landing Field Elevation (LFE) Indication	C	1	0		(O) May be inoperative provided that for landing field elevation above 8,000 feet MSL, the airplane is manually depressurized before landing.
31-02 Outflow Valve (OFV)	C	1	0		(O)(M) May be inoperative provided: a) NPRV is removed and, b) Flight is conducted unpressurized at or below 10,000 feet MSL.
31-03 Negative Pressure Relief Valve (NPRV)	C	1	0		(O) May be inoperative provided flight is conducted unpressurized at or below 10,000 feet MSL.
31-04 Pressure Relief Valve (PRV)	C	1	0		(O) May be inoperative provided flight is conducted unpressurized at or below 10,000 feet MSL.
52-00 Vapor Cycle System (VCS)	C	1	0		May be inoperative provided OAT is limited to no more than ISA +19C.

U.S. DEPARTMENT OF TRANSPORTATION		MASTER MINIMUM EQUIPMENT LIST			
FEDERAL AVIATION ADMINISTRATION					
AIRCRAFT: EMB-500		REVISION NO: 2 DATE: 05/06/2011		PAGE NO: 31-1	
1. SYSTEM, SEQUENCE NUMBERS & ITEM	REPAIR CATEGORY	2. NUMBER INSTALLED		3. NUMBER REQUIRED FOR DISPATCH	
					4. REMARKS AND EXCEPTIONS
31 INDICATING/RECORDING SYSTEMS					
22-01 Yoke Chronometer Pushbutton	D	2	1		For single pilot operations, copilot side may be inoperative.
	C	2	0		For operations requiring a second in command, both may be inoperative.
31-01 Cockpit Voice And Data Recorder					
1) Cockpit Voice Recorder (CVR) Function	D	1	0		
2) Flight Data Recorder (FDR) Function	D	1	0		
41-07 Avionics Blower	C	1	0		May be inoperative provided: a) VCS is operative, and b) Cockpit Evaporator Fan is operative.
60-00 *** Electronic Checklist (ECL)	C	1	0		May be inoperative provided current revision of approved paper checklists are available and used.

Minimum Equipment List (Cont.)

22. Repair Intervals: All users of an MEL approved under FAR 121, 125, 129 and 135 must effect repairs of inoperative systems or components, deferred in accordance with the MEL, at or prior to the repair times established by the following letter designators:

Category A. Items in this category shall be repaired within the time interval specified in the remarks column of the operator's approved MEL.

Category B. Items in this category shall be repaired within three (3) consecutive calendar days (72 hours), excluding the day the malfunction was recorded in the aircraft maintenance record/logbook. For example, if it were recorded at 10 a.m. on January 26th, the three day interval would begin at midnight the 26th and end at midnight the 29th.

Category C. Items in this category shall be repaired within ten (10) consecutive calendar days (240 hours), excluding the day the malfunction was recorded in the aircraft maintenance record/logbook. For example, if it were recorded at 10 a.m. on January 26th, the 10 day interval would begin at midnight the 26th and end at midnight February 5th.

Category D. Items in this category shall be repaired within one hundred and twenty (120) consecutive calendar days (2880 hours), excluding the day the malfunction was recorded in the aircraft maintenance log and/or record.
The letter designators are inserted adjacent to Column 2.

Kinds of Operations Equipment List (KOEL)

KINDS OF OPERATIONS EQUIPMENT LIST (Continued)

System, Instrument, Equipment and/or Function	KIND OF OPERATION				COMMENTS
	V F R D A Y	V F R N I G H T	I F R D A Y	I F R N I G H T	
VACUUM					
1 - Engine Driven Vacuum Pump	0	0	1	1	
2 - Vacuum Indicator	0	0	1	1	
ENGINE FUEL AND CONTROL					
1 - Fuel Flow Indicator	1	1	1	1	
ENGINE INDICATING					
1 - Tachometer (RPM)	1	1	1	1	
2 - Cylinder Head Temperature (CHT) Indicator	0	0	0	0	
3 - Oil Pressure Indicator	1	1	1	1	
4 - Oil Temperature Indicator	1	1	1	1	
ENGINE OIL					
1 - Engine Crankcase Dipstick	1	1	1	1	

Don't Have the Required Equipment and Still Need to Fly?

- Need to apply for a special flight permit (also sometimes called a ferry permit) through the FAA Flight Standards District Office (FSDO)
- Cannot carry non-essential personnel

VII. SPECIAL FLIGHT PERMIT PURPOSES OTHER THAN PRODUCTION FLIGHT TEST	A. DESCRIPTION OF AIRCRAFT						
	REGISTERED OWNER MIKE'S AIR, LLC	ADDRESS 1234 SHADY LN., ST. LOUIS, MO 63123					
	BUILDER (Make) CIRRUS DESIGN CORP.	MODEL SR22					
	SERIAL NUMBER 2345	REGISTRATION MARK N54321					
	B. DESCRIPTION OF FLIGHT						
	CUSTOMER DEMONSTRATION FLIGHTS <input type="checkbox"/> (Check if applicable)						
	FROM KCPS	TO KSUS					
	VIA DIRECT	DEPARTURE DATE 12/16/2013 to 12/22/2013					
		DURATION 20 MINUTES					
	C. CREW REQUIRED TO OPERATE THE AIRCRAFT AND ITS EQUIPMENT						
<input checked="" type="checkbox"/>	PILOT	<input type="checkbox"/>	CO-PILOT	<input type="checkbox"/>	FLIGHT ENGINEER	<input type="checkbox"/>	OTHER (Specify)
D. THE AIRCRAFT DOES NOT MEET THE APPLICABLE AIRWORTHINESS REQUIREMENTS AS FOLLOWS: ANNUAL INSPECTION SIGNED OFF AS UNAIRWORTHY WITH ONE DISCREPANCY: THE #2 CYLINDER COMPRESSION MEASURES 2 PSI BELOW THE MASTER ORIFICE THRESHOLD PER TCM SB03-3.							
E. THE FOLLOWING RESTRICTIONS ARE CONSIDERED NECESSARY FOR SAFE OPERATION. (Use attachment if necessary) NONE.							
F. CERTIFICATION - I hereby certify that I am the registered owner (or his agent) of the aircraft described above, that the aircraft is registered with the Federal Aviation Administration in accordance with Title 49 of the United States Code 44101 et seq. and applicable Federal Aviation Regulations, and that the aircraft has been inspected and is safe for the flight described.							
DATE 12/12/2013	NAME AND TITLE (Print or type) MIKE MERRIWEATHER, MANAGING MEMBER	SIGNATURE X					