BOEING 767 series

with JT9D-7R4 & GE80C2 engines

General Familiarization

by Steve Oebermann

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DETAILS:
This book is a study guide for the Boeing 767 Aircraft and it includes an additional chapter on the EICAS/CMC. This book is a great tool for review, refresher, new hires, pre-requisite training, and preparation for systems level classes. There are many benefits for students, technicians, teachers, MRO Training Departments, and Airlines alike.

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Self Paced Training Study Guide

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B767 GENERAL FAMILIARIZATION

This course covers an overview of the Mechanical Systems to include: Description and Operation, Controls and Indications, Component Location, & Servicing.

OBJECTIVES

Upon completion of this training, using the study guide provided and appropriate Maintenance Manuals, the student will be able to:

1. Describe the safety precautions to be observed when working on or near the aircraft and its systems.
2. Describe the locations of principle components.
3. Describe the normal functions of each major system, including terminology and nomenclature.
4. Using the proper maintenance manual reference, perform all aircraft system servicing tasks.
5. Interpret reports provided by the crew members.

TABLE OF CONTENTS
767 GENERAL FAMILIARIZATION
ATA 06

MANUAL ARRANGEMENT AND NUMBERING SYSTEM

The Maintenance Manual is divided into chapters and groups of chapters. Each group and every chapter has a tab provided for ease of location. The chapterization separates the manual into the primary functions and systems of the airplane. The chapters are further divided into sections and subjects to provide for subsystem and individual unit breakout. Each chapter, section and subject is identified by an assigned number. Each page carries the assigned subject number, page number, page code and the revision date.

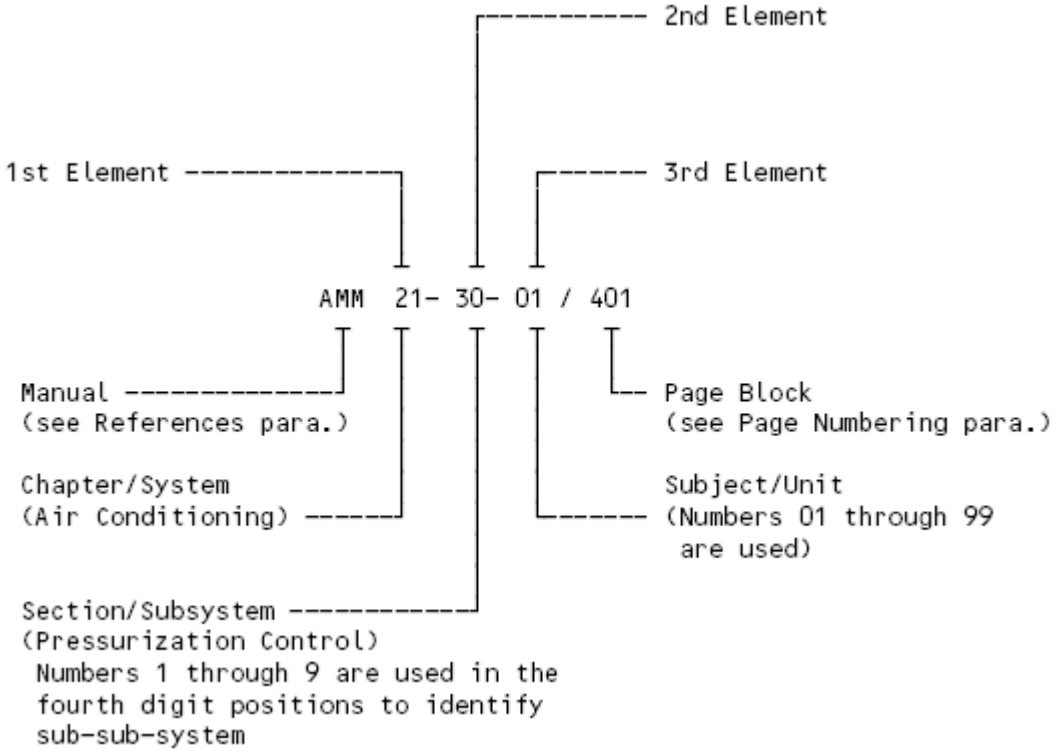
In addition, the Power Plant chapters are issued in a self-contained set or sets (as applicable, if you have more than one engine type in your model fleet). These pages are further identified by an engine sub-logo, for example PW (Pratt & Whitney) SERIES ENGINES or RB (Rolls-Royce) SERIES ENGINES, placed to the right of the Maintenance Manual logo at the top of the page. The numbering system is described in detail in the paragraphs that follow.

Chapter Numbering

Chapterization of the maintenance manual has provided a functional breakdown of the entire airplane. The chapter breakdown numbering system uses a three element number (XX-XX-XX). It provides for dividing the material into Chapters, Sections, and Subjects.

The three elements of the indicator each contain two digits.

For example:



Chapter Numbering Continued:

The chapter number (1st element) and the first number of the section number (2nd element) are assigned by ATA Specification No. 100. Material which is applicable to a system as a whole uses zeros in the 2nd and 3rd elements of the numbers. That is, the chapter number followed by "-00-00".

For example:

AMM 22-00-00/001 (Auto Flight) is used for general description information which provides an outline breakdown of the sections in the chapter.

Effectivity and Configuration Numbering

On each page, there is effectivity data at the lower, inner margin (Fig. 1). When a page applies to all airplanes, the word “ALL” is in the effectivity block. If the data does not apply to all airplanes, then the effectivity will be one of these types:

1. Physical description - A description of the differences that you can see.

   When a physical description is used, a reference to the applicable service bulletin and PRR (production change) are provided when that is possible. This is done primarily for the benefit of airline engineering, and maintenance planning groups.

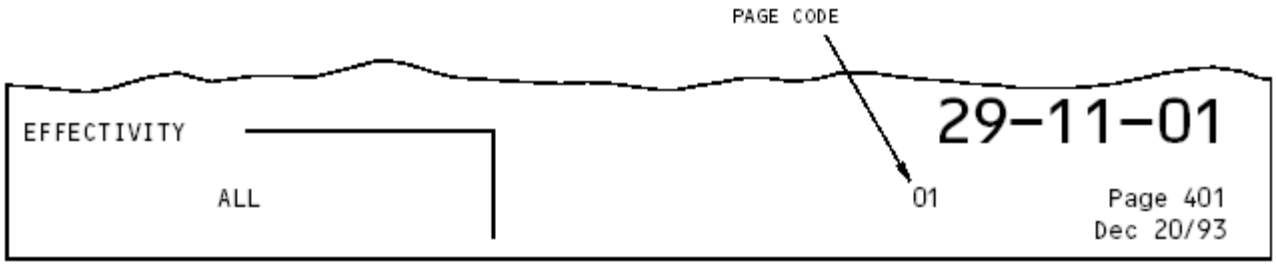
   For example: AIRPLANES WITH VALVE INSTALLED AWAY FROM THE FILTER (POST-SB 28A-17 OR PRR 54009) AIRPLANES WITH VALVE INSTALLED NEAR THE FILTER (PRE-SB 28A-17)

2. Component dash number - The last digits of the identification number that are on an electrical box.

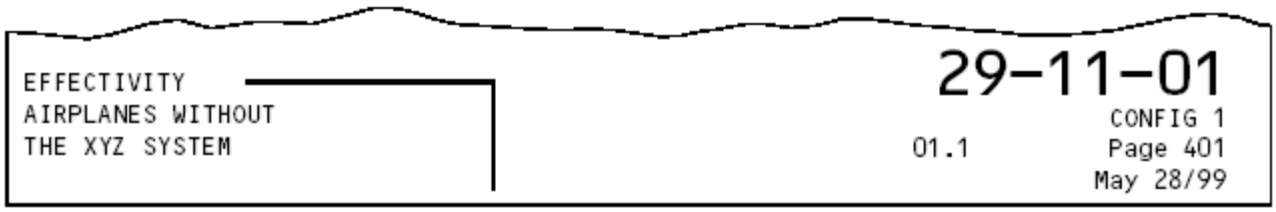
3. Airplane effectivity numbers - The airline three-letter code, and the numbers or letters that Boeing and each airline agreed on to identify each airplane. If the effectivity is applicable to all subsequent airplanes, the last digits will be 999.

   For example: 205-999 indicates airplane 205 and all subsequent airplanes.

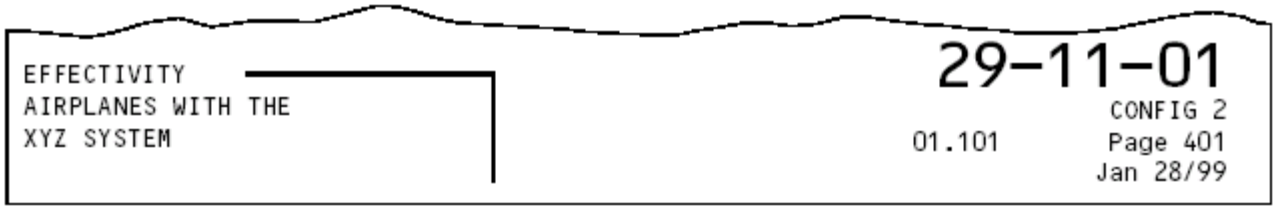
   Each paragraph can have an effectivity. Each effectivity is in upper-case letters, on the first line of the paragraph.



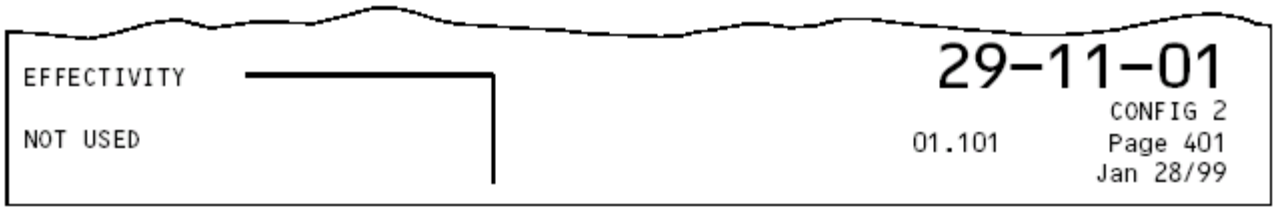
NON-CONFIG PROCEDURE EXAMPLE



CONFIG 1 PROCEDURE EXAMPLE



CONFIG 2 PROCEDURE EXAMPLE



CONFIG – NOT USED EXAMPLE

Effectivity, Page Code and Configuration Procedure Examples
Figure 1

Effectivity and Configuration Numbering Continued:

When effectivity differences are extensive and the preceding method becomes cumbersome and distracting from the continuity of subject matter, new page blocks are created. These added page blocks are identified by the addition of a configuration code (CONFIG) immediately above the page number. A previously issued page block is re-issued to incorporate the configuration code as shown in Fig. 1. Configuration codes are issued at page block level only. They are usually used when a change to the airplane results in a major change to the manual. Configuration codes are typically used when there are multiple configurations of page block applicable to a customer's fleet.

In some instances, you can have CONFIGs that are provided as place holders. These procedures will be indicated as "NOT USED" in the effectivity block in the lower left corner of the page (Fig. 1).

For the effectivity information in the power plant (70 series) chapters of the manual, two situations can exist. The word "ALL" placed in the effectivity block on a page means that the page pertains to either all airplanes or all engines, whichever the case may be. When the effectivity is limited to a system or component that remains with the airplane during the power plant replacement, the effectivity is expressed in a manner described in the preceding paragraphs. When a manual section, page, step or illustration is limited to an engine type or component, the effectivity is given using the engine model, physical difference, or part number.

The word "ALL" in the effectivity block on a page means that the page pertains to all airplanes (if you have only one engine type in your model fleet) or 2) All engines (if you have multiple engine types in your model fleet), whichever the case may be.

Page Numbering

Each page block has its own page numbers. The page numbers are in the lower right corner of each page. The page blocks categorize the tasks that they contain. The page blocks are defined by ATA Specification 100:

NOMENCLATURE	PAGE BLOCK
DESCRIPTION AND OPERATION (D&O)	1 to 99
FAULT ISOLATION (FI)	101 to 199
MAINTENANCE PRACTICES (MP)	201 to 299
SERVICING (SRV)	301 to 399
REMOVAL/INSTALLATION (R/I)	401 to 499
ADJUSTMENT/TEST (A/T)	501 to 599
INSPECTION/CHECK (I/C)	601 to 699
CLEANING/PAINTING (C/P)	701 to 799
APPROVED REPAIRS (AR)	801 to 899

When it is convenient for the user to have different types of tasks in one page block, MAINTENANCE PRACTICES, the 201-to-299 page block, is used.

LIST OF ABBREVIATIONS

A/C: air conditioning
A/G: air/ground
A/L: auto land
A/P: autopilot
A/S: airspeed
A/T: auto throttle, adjustment/test
ABNORM: abnormal
AC: alternating current
ACARS ARINC: Communications Addressing and Reporting System
ACCEL: acceleration, accelerate
ACM: air cycle machine
ADC: air data computer
ADF: automatic direction finder
ADI: attitude director indicator
ADP: air driven pump, air driven hydraulic pump
ADV: advance
AFCS: automatic flight control system
AGL: above ground level
AI: anti-ice
AIDS: aircraft integrated data system
AIL: aileron
ALT: altitude
ALTM: altimeter
ALTN: alternate
ALTNT: alternate
AMB: ambient
AMM: Airplane Maintenance Manual
ANN: announcement
ANNUNC: annunciator
ANT: antenna
AOA: angle of attack
APB: auxiliary power breaker
APD: approach progress display
APL: airplane
APPR: approach
APPROX: approximately
APU: auxiliary power unit
ARINC: Aeronautical Radio Incorporated
ARINC IO ARINC: I/O error
ARNC STP ARINC I/O UART: data strip error
ASA: auto land status annunciator
ASP: audio selector panel
ASYM: asymmetrical
ATC: air traffic control
ATC/DABS: air traffic control/discrete address beacon system
ATT: attitude
ATTND: attendant
AUTO: automatic
AUX: auxiliary
AVM: airborne vibration monitor
B/CRS: back course
BARO: barometric
BAT: battery
BFO: beat frequency oscillator
BITE: built-in test equipment
BK: brake
BKGRD: background
BPCU: bus power control unit
BRKR: breaker
BRT: bright
BTB: bus tie breaker
BTL: bottle
C/B: circuit breaker
C: center
°C: degrees Centigrade
CADC: central air data computer
CAPT: captain
CB: circuit breaker
CCA: central control actuator
CCW: counterclockwise
CDU: control display unit
CH: channel
CHAN : channel
CHG: change
CHR: chronograph
CHRGR: charger
CK: check
CKT: circuit
CL: close
CLB: climb
CLR: clear
CLSD: closed
CMD: command
CMPTR: computer
CNX: cancelled
COL: column
COMM: communication
COMP: compressor
COMPT: compartment
CON: continuous
COND: condition
CONFG: configuration
CONFIG: configuration
CONN: connection
CONT: control
CP: control panel
CPCS: cabin pressure control system
CPS: cycles per second

CRS: course
CRT: cathode ray tube
CRZ: cruise
CSEU: control system electronics unit
CT: current transformer
CTN: caution
CTR: center
CU: control unit
CUST: customer
CW: clockwise
CWS: control wheel steering
DA: drift angle
DADC: digital air data computer
DC: direct current
DEC: decrease, decrement
DECEL: decelerate
DECR: decrease
DEG: degree
DEPR: depressurize
DEPT: departure
DEST: destination
DET: detector
DETNT: detent
DEV: deviation
DFDR: digital flight data recorder
DG: directional gyro
DH: decision height
DIFF: differential
DIR: direct
DISC: disconnect
DISCH: discharge
DISCONT: discontinued
DISENG: disengage
DISP: dispatch
DIST: distance
DK: deck
DME: distance measuring equipment
DMU: data management unit
DN: down
DPCT : differential protection current transformer
DR: door
DSCRT IO: discrete I/O error
DSPLY: display
DSPY: display
EADI: electronic attitude director indicator
ECON: economy
ECS: environmental control system
EDP: engine driven pump, engine hydraulic pump
EEC: electronic engine control
EFDARS: expanded flight data acquisition and reporting system
EFI: electronic flight instruments
EFIS: electronic flight instrument system
EGT: exhaust gas temperature
EHSI: electronic horizontal situation indicator
EICAS: engine indicating and crew alerting system
ELEC: electrical
ELEV: elevation
EMER: emergency
ENG: engage, engine
ENT: entrance, entry
ENTMT: entertainment
EPC: external power contactor
EPR: engine pressure ratio
EPRL: engine pressure ratio limit
EQUIP: equipment
ERR: error
ESS: essential
EVAC: evacuation
EVBC: engine vane and bleed control
EXH: exhaust
EXT: external
EXTIN: extinguish, extinguished
EXTING: extinguishing
F/D: flight director
F/F: fuel flow
F/O: first officer
°F: degrees Fahrenheit
FAA: Federal Aviation Administration
FCC: flight control computer
FCEU: flight controls electronic unit
FCU: fuel control unit
FDR: feeder
FIM: Fault Isolation Manual
FL: flow
FL/CH: flight level change
FLD: field
FLT: flight
FLUOR: fluorescent
FMC: flight management computer
FMS: flight management system
FREQ: frequency
FRM: Fault Reporting Manual
FSEU: flap/slat electronic unit
FT: feet, foot
FWD: forward
G/S: glide slope, ground slope
GA: go-around
GB: generator breaker
GCB: generator circuit breaker
GCR: generator control relay
GCU: generator control unit
GEN: generator
GHR: ground handling relay

GND: ground
GP: group
GPWS: ground proximity warning system
GR: gear
GRD: ground
GS: ground speed
GSSR: ground service select relay
GSTR: ground service transfer relay
GW: gross weight
H/L: high/low
HDG: heading
HF: high frequency
HORIZ: horizontal
HP: high pressure
HSI: horizontal situation indicator
HTR: heater
HYD: hydraulic
IAS: indicated airspeed
IDENT: identification
IDG: integrated drive generator
IGN: ignition
ILLUM: illuminate, illuminated
ILS: instrument landing system
IMP: imperial
IN: in, input
INBD: inboard
INC: incorporated, increase, increment
INCR: increase
IND: indicator
INFC: interface
INFLT: inflight
INHIB: inhibit
INIT: initiation
INOP: inoperative
INPH: interphone
INST: instrument
INT: interphone
INTLK: interlock
INTPH: interphone
INTMT: intermittent
IP: intermediate pressure
IRS: inertial reference system
IRU: inertial reference unit
ISLN: isolation
ISOL: isolation
IVSI: instantaneous vertical speed indicator
KG: kilograms
KIAS: knots indicated airspeed
KTS: knots
L: left
L/R: left/right
L-NAV: lateral navigation
LAV: lavatory
LB: pound
LBS: pounds
LCD: liquid crystal display
LCR: left-center-right
LDG: landing
LDG GR: landing gear
LE: leading edge
LED: light emitting diode
LF: left front
LGT: light
LH: left hand
LIM: limit
LOC: localizer
LN: left nose
LR: left rear
LRRA: low range radio altimeter
LRU: line replaceable unit
LSB: lower side band
LVR: lever
LW: left wing
LWR: lower
M-SPD: manual speed
MAG: magnetic
MAINT: maintenance
MALF: malfunction
MAN: manual
MAX: maximum
MCDP: maintenance control display panel
MCP: mode control panel
MCU: modular concept unit
MDA: minimum decision altitude
MIC: microphone
MIN: minimum
MM: Maintenance Manual
MOD: module
MON: monitor
MOT: motion
MPU: magnetic pickup
MSG: message
MSTR: master
MSU: mode selector unit
MTG: miles to go
MU: management unit
MUX: multiplexer
N/A: not applicable
NAC: nacelle
NAV: navigation
NCD: no computed data
NEG: negative
NEUT: neutral
NLG: nose landing gear

NO: number
NORM: normal
NRM: normal
NVMEM RD: non-volatile memory read error
NVMEM WR: non-volatile memory write error
02: oxygen
OBS: observer
OK: okay
OPR: operate
OPT: option
OPRN: operation
OUT: output
OUTBD: outboard
OVHD: overhead
OVHT: overheat
OVRD: override
OXY: oxygen
P/RST: press to reset
P/S: pitot/static
PA: passenger address
PASS: passenger
PCA: power control actuator
PCT: percentage
PDI: pictorial deviation indicator
PES: passenger entertainment system
PLA: power level angle
PLT: pilot
PMG: permanent magnet generator
PNEU: pneumatic
PNL: panel
POR: point of regulation
POS: position, positive
PPOS: present position
PRESS: pressure
PRG FLOW: program flow error
PRIM: primary
PROC: procedure
PROG MEM ROM: memory error
PROJ: projector
PROT: protection
PS: pitot static
PSI: pounds per square inch
PSS: passenger service system
PSU: passenger service unit
PTT: push to talk
PTU: power transfer unit
PWR: power
QAD: quick-attach-detach
QTS: quarts
QTY: quantity
R/T: rate of turn
R/W MEM RAM: memory error
R: right
RA: radio altimeter, radio altitude
RAT: ram air turbine
RCVR: receiver
RDMI: radio distance magnetic indicator
REC: recorder
RECIRC: re-circulate
REF: reference
REFRIG: refrigeration
REG: regulator
REL: release
REP: representative
REQ: required
RES : reserve
RESSTART: power interrupt restart error
REV: reverse
RF: right front
RH: right hand
RLSE: release
RLY: relay
RLY/SW: relay/switch
RMI: radio magnetic indicator
RMT OUT: high-speed ARINC output error
RN: right nose
ROT: rotation
RPM: revolutions per minute
RPTG: reporting
RR: right rear
RST: reset
RTO: rejected takeoff
RUD: rudder
RW: right wing
RWY: runway
SAM: stabilizer trim/elevator asymmetry limit module
SAT: static air temperature
SEC: second
SEI: standby engine indicator
SEL: select
SELCAL: selective calling
SERV: service
SG: signal generator
SLCTD: selected
SLCTR: selector
SOV: shut off valve
SP: speed
SPD: speed
SPD BK: speed brake
SQL: squelch
SSB: single side band
STA: station
STAB: stabilizer

STBY: standby
STS: system status
SURF: surface
SW: switch
SWITCH IN: switch input error
SYNC: synchronous
SYS: system
SYST: system
T/R: thrust reverser
T.O. : takeoff
TACH: tachometer
TAI: thermal anti-ice
TAS: true airspeed
TAT: total air temperature
TCC: turbine case cooling
TE: trailing edge
TEMP: temperature
TFR: transfer
THR: thrust
THROT: throttle
THRSH: threshold
THRT: thrust
THRU: through
TIE: bus tie
TLA: thrust lever angle
TMC: thrust management computer
TMS: thrust management system
TMSP: thrust mode select panel
TO: takeoff
TOL: tolerance
TR: transformer rectifier
TRP: thrust rating panel
TUNE: tuner
TURB: turbine
TURBL: turbulent, turbulence
UBR: utility bus relay
UPR: upper
USB: upper side band
V/NAV: vertical navigation
V/S: vertical speed
VERT: vertical
VERT: SPD vertical speed
VFY: verify
VG: vertical gyro
VHF: very high frequency
VIB: vibration
VLD: valid
VLV: valve
VOL: volume
VOLT: voltage
VOR VHF: omni range receiver
VOX: voice
VTR: video tape reproducer
W/D: wiring diagram
W/W: wheel well
WARN: warning
WG: wing
WHL: wheel
WHLS: wheels
WPT: waypoint
WSHLD: windshield
WX: weather
WXR: weather
X-CH: cross channel
X-CHAN: cross channel
XDCR: transducer
XMISSION: transmission
XMIT: transmit
XMTR: transmitter
XPNDR: transponder
Y/D: yaw damper

REFERENCE PLANES AND LINES

The airplane is divided into reference planes (stations), waterlines and buttock lines. These are measured in inches from fixed points of reference. This provides a means of quickly identifying the location of components, the center of gravity and the distribution of the weight.

Standard Abbreviations and Definitions:

Fuselage

B STA, BS, or STA: Body (Fuselage) Station.
This is a plane perpendicular to the fuselage centerline, It is located 92.50 inches forward of the nose.

BBL or BL: Body (Fuselage) Buttock Line.
This is a vertical plane parallel to the fuselage vertical centerline plane, BBL 0.00 located by its distance outboard from the fuselage centerline plane.

BRP: Body (Fuselage) Reference Plane.
This is a plane perpendicular to the BBL plane and passes through the top of the main deck floor beams (BWL 200.00).

BWL or WL: Body (Fuselage) Waterline.
This is a plane perpendicular to the BBL plane. It is located by its distance from a parallel imaginary plane (BWL 0.00). BWL 0.00 is 106.70 inches below the lowest fuselage surface.

LBL: Left Buttock Line

RBL: Right Buttock Line

Wing

FS or RS: Front Spar or Rear Spar
The Wing Front Spar and Rear Spar are principal members along the spar and on the diagonal of the wing structure. They are vertical to the wing reference plane.

IFSS: Inboard Front Spar Stations.
This is a plane vertical to the wing reference plane and the plane of the inboard front spar. It is measured from the intersection of the leading edge extension and the wing buttock line 0.00.

LES: Leading Edge Station.
These are planes perpendicular to the wing reference plane and the leading edge. They are measured from the intersection of the leading edge extension and the wing buttock line 0.00.

Wing Definitions (Continued):

MAC: Mean Aerodynamic Chord.
This is the chord of a section of an imaginary airfoil, which would have vectors throughout the flight range identical to those of the actual wing.

OFSS: Outboard Front Spar Stations.
The Outboard Front Spar Station is a plane vertical to the wing reference plane and the plane of the outboard front spar. It is measured from the intersection of the leading edge extension and the wing buttock line 0.00.

RS: See definition for FS.

W STA or WS: Wing Station.
The Wing Station is a plane vertical to the wing reference plane and the plane of the rear spar. It is measured from the intersection of the extended leading edge and the wing buttock line 0.00.

WBL: Wing Buttock Line.
The Wing Buttock Line is a plane vertical to the wing reference plane and parallel to the trace of the fuselage centerline. It is measured from the intersection of the wing reference plane and the body buttock line 0.00.

WRP: Wing Reference Plane.
This is the datum plane of the wing. It is inclined up 6 degrees with respect to the BWL plane and passes through the intersection of the BBL 0.00 and BWL 148.76.

WTS: Wing Tip Station.
This is a plane vertical to the wing reference plane and wing buttock line 0.00. It is measured from the intersection of the leading edge and wing buttock line 0.00.

Vertical Stabilizer

FIN STA: Fin Station.
This is a plane vertical to the centerline of the vertical stabilizer rear spar. Distance is measured from the Fin Station 0.00, which is the intersection of the rear spar centerline extension and the body waterline 299.46.

FSS: Front Spar Station.
This is a plane vertical to the vertical stabilizer front spar. The plane is measured from the fin front spar station 0.00, which is the intersection of the front spar centerline extension and the body waterline 299.46.

RUD STA: Rudder Station.
These are planes vertical to the rudder hinge centerline. The plane is measured from Rudder Station 0.00, which is the intersection of the rudder hinge centerline and the body waterline 299.46.

Horizontal Stabilizer

AUX SPAR STA: Auxiliary Spar Station.
These are planes vertical to the horizontal stabilizer auxiliary spar. The plane is measured from Auxiliary Spar Station 0.00, which is the intersection of the auxiliary spar extension and the stabilizer buttock line 0.00.

ELEV STA: Elevator Station.
These are planes vertical to the elevator hinge centerline. The plane is measured from the intersection of the elevator hinge centerline and the stabilizer buttock line 0.00.

FS STA: Front Spar Station.
These are planes vertical to the horizontal stabilizer front spar. The plane is measured from Front Spar Station 0.00, which is the intersection of the front spar and the trace of body buttock line 41.50 at the horizontal stabilizer reference plane.

HSBL: Stabilizer Buttock Line.
This is a plane vertical to the horizontal stabilizer reference plane and parallel to the trace of the fuselage centerline. It is measured from stabilizer Buttock Line 0.00, which is the intersection of the horizontal stabilizer reference plane of the body buttock line 0.00.

HSRP: Horizontal Stabilizer Reference Plane.
This is the datum plane of the horizontal stabilizer. It is inclined 7° up with respect to the BWL plane and passes through the intersection of the BBL 0.00 and BWL 238.015 planes.

LE STA: Leading Edge Station.
This is a plane vertical to the horizontal stabilizer leading edge. It is measured from Stabilizer Leading Edge Station 0.00, which is the intersection of the leading edge line extension and the stabilizer buttock line 0.00.

RS STA: Rear Spar Station.
This is a plane vertical to the horizontal stabilizer rear spar. It is measured from Rear Spar Station 0.00, which is the intersection of the rear spar and the trace of body buttock line 41.50 at the horizontal stabilizer reference plane.

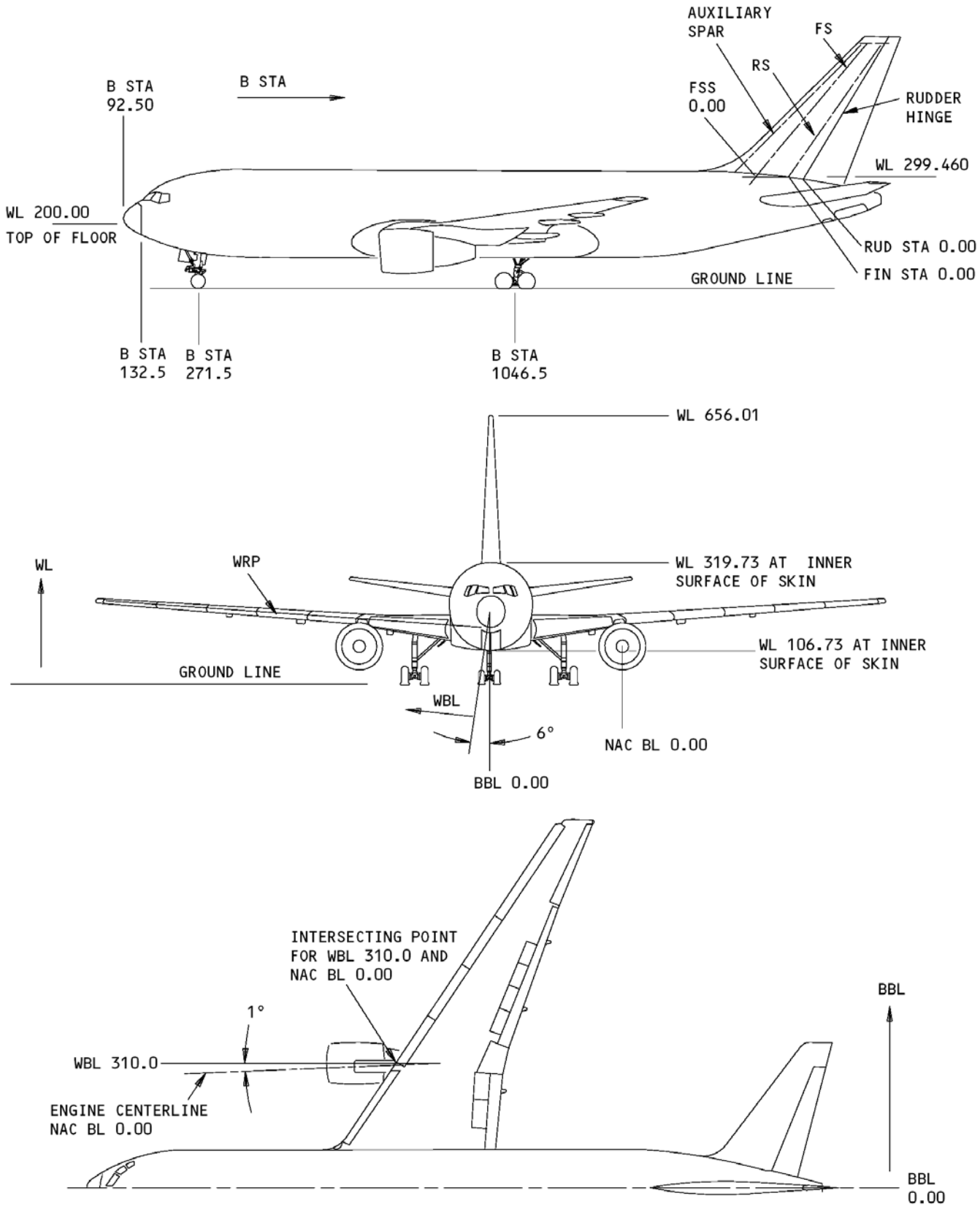
STAB STA: Stabilizer Station.
This is a plane vertical to the stabilizer rear spar and the horizontal stabilizer reference plane. Stabilizer station 0.00 is at the intersection of the leading edge extension, body buttock line 0.00, and the horizontal stabilizer reference plane.

Power Plant

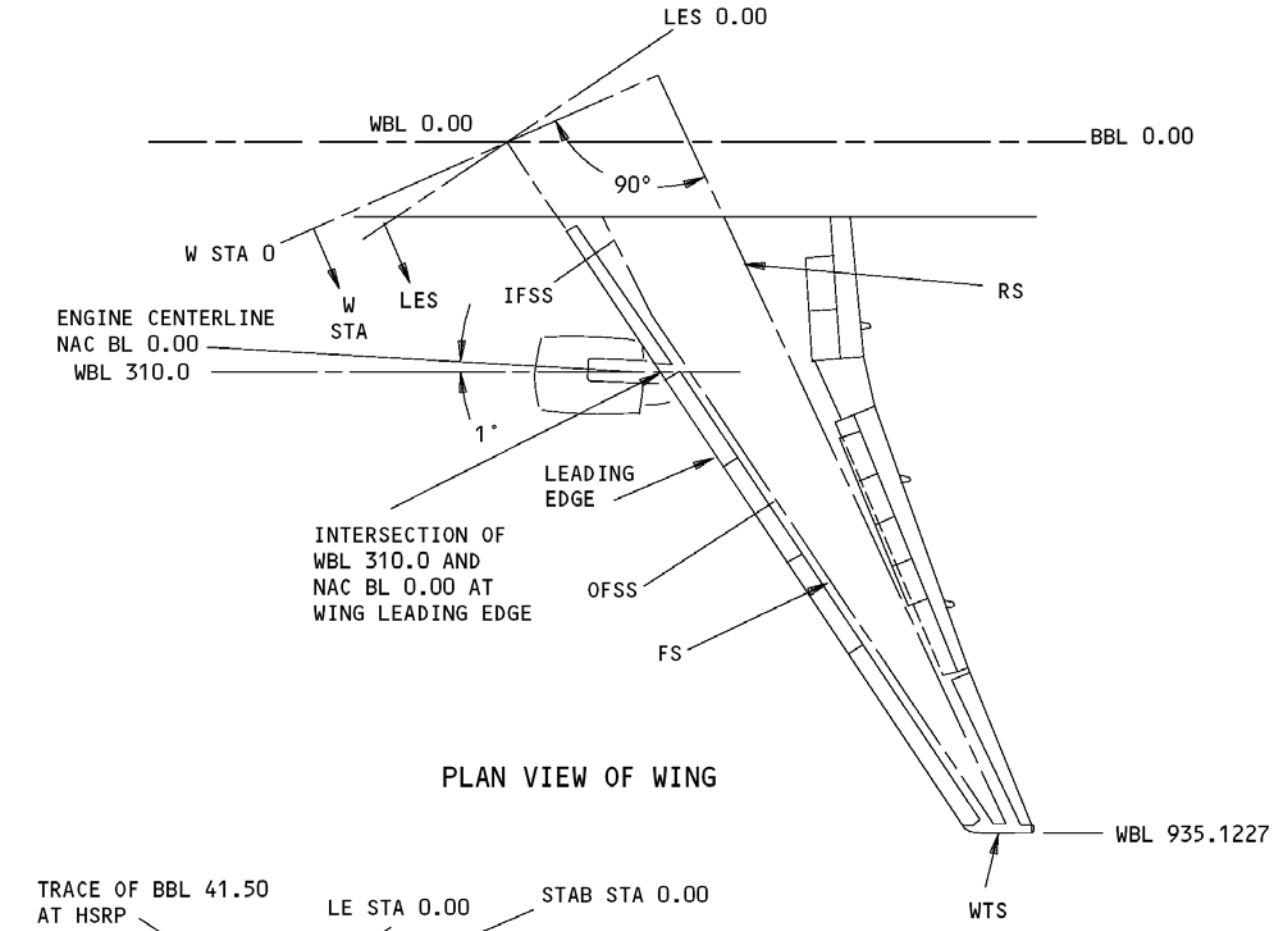
NAC BL: Nacelle Buttock Line.
The Nacelle Buttock Line is a plane vertical to the wing reference plane and parallel to the nacelle centerline. The Nacelle Buttock Line 0.00 for the engine has an angle of 1 degree inboard from the Wing Buttock Line 310.00 at the wing leading edge.

NAC STA: Nacelle Station
T The Nacelle Station is a plane vertical to the nacelle centerline. It is measured from a point 95.45 inches forward of the face of the engine fan.

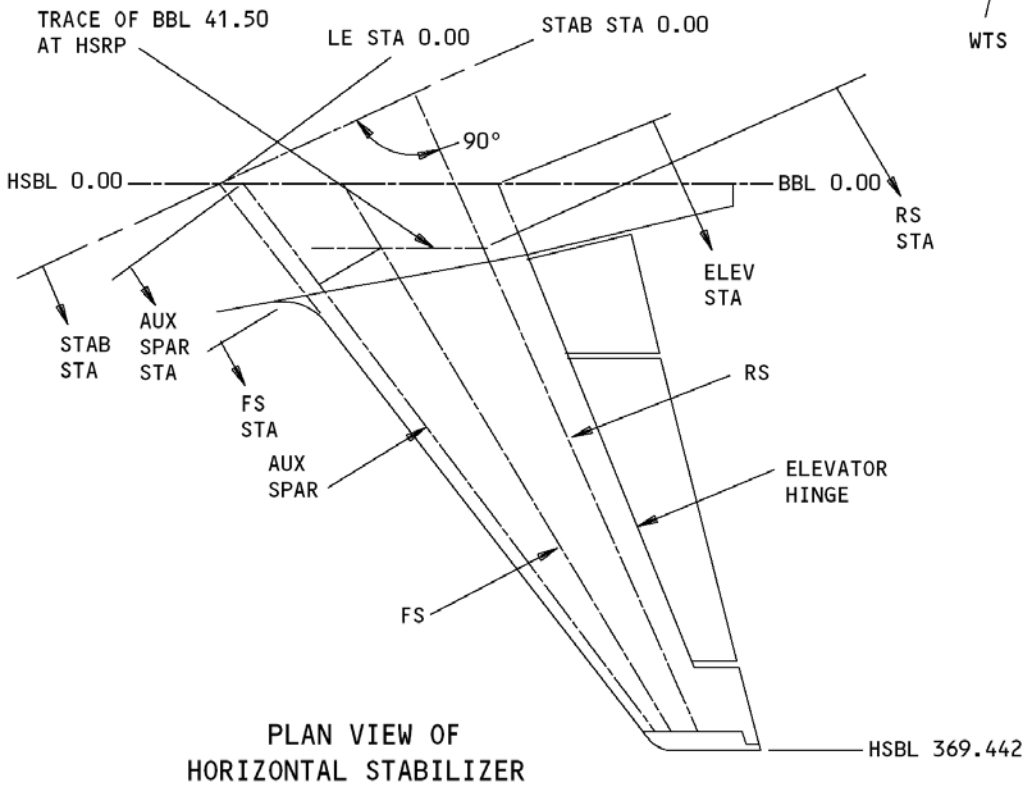
NAC WL: Nacelle Waterline.
The Nacelle Waterline is a plane vertical to the NAC BL datum plane (NAC BL 0.00) and with a slope of 2.40534 degrees up from the wing reference plane. The NAC WL 100.00 (centerline of engine) is measured 68.47 inches down from the wing leading edge at WBL 310.



Reference Planes and Lines



PLAN VIEW OF WING



PLAN VIEW OF HORIZONTAL STABILIZER

Reference Planes and Lines

PRIMARY AIRCRAFT DIMENSIONS