* **General**
* 3 crew, 9 personnel (12 seat)
* 9 position lights
* Length 57’ 0.67”
* Rotor diameter 48’
* Turning Radius 48’ 3.3”
* Tail rotor diameter 8’ 6”
* Min blade tip ground clearance 7’ 9.91”
* Mast tilted 5 deg fwd
* Max GW (internal) 10500 lb (external) 11,200 lb
* WSPS 90% coverage, contact ground 10 deg NL
* ELT freq 121.5,243.0, 406.028
* ELT:
	+ 406.028 tx posit within 1-2 km, for 24 hrs
	+ Tx on guard for 50 hrs (batt exhausted)
	+ Auto on >4.5 +/- 0.5 fps descent
	+ GPS reports posit within 100 meters
	+ Test ELT first 5 min any hour UTC no more than 5 sec
* An IDENT reply lasts 18+/-2 seconds
* Wait 25 mins after Bat off to tow
* Inertial reels lock 3.1-3.5 Gs
* 4 first aid kits in cabin
* Min crew 1 pilot
* Bleed Air= COBDICS
	+ Cabin Heating
	+ Oil cooling fan
	+ Bleed band actuators
	+ Deice
	+ Inertial Particle Separator
	+ Cabin defrost
	+ Start fuel purge nozzles
* Starter limits 35 sec /3 min/ 35 sec/ 30 min/ 35 sec
* <40 F/5 C: icing of engine air inlet screens expected
* Approach: 12º NH tail/skids contact gnd same time
* Static gauge indication = 0-3
* Chip detectors: 3 xmsn, 90, 45, engine
* Audio/light
	+ Nr High 103 +/- 1.5 (Light)
	+ Nr Low 92.5+/- 1.5 (Light/Audio)
	+ Nf High 103 +/- 1.0 (Light)
	+ Nf Low 92 +/- 1.5 (Light)
	+ Nr & Nf tac gen fail (Light/Audio)
* **Weight/Balance/TOLD**
* Cabin floor rated 100lb/ft2
* Cargo hook 4000-5000 lb depending on hook
* Lateral CG limit +/-7.5”
* CG>140 term approach 5’ hover
* <=8500 lb, CG 130-144
* 8500-10500 CG 136.2-141.8
* No external loading if CG >142
* **Fuel**
* 5 cells
* 208.5 gallons, 206.5 usable
* JP8 weighs 6.7 lb/gal
* 20 min fuel light: 130-240 lbs
* 8-25 psi (2 pumps)
* .50 cal ballistic protection in lower 2/3 of cell
* Fuel capacitance measures from 0-1575 lbs
* Overspeed gov maintains rpm +-50
* Droop Cam comp keeps rpm +-40
* Engine design droop: 4-6%
* Start fuel off by 750 deg
* GOV switch emer lose 11-15%Q
* Most fwd CG at 70 gal
* 300 gal aux tanks
* **Hydraulics (FAILSAFE)**
* Reservoir: 5.3 pints
* Total: 10 pints
* Filter pops 70+-10 psi
* MC light 1000 psi and decreasing
* MC light extinguish 1200+-100 psi and increasing
* 1500 psi (cyclic) 1000 psi (collective/pedals)
* **Electrical**
* GPU: 7.5 kw, 600 amps min (> 29.5 turn off)
* Battery: NiCad, 24 V, 34 amp-hr (need 23.5 to start)
* 16V by 10% N1 at Start
* Generators: 30 V 300 amp
* AC power 26V (via inverter)
* 26 VAC
	+ Fuel Qty indicator
	+ Fuel Px indicator
* **Engine**
* T53-L-703 engine
* Idle: 68-72% Ng
* 5 min TOP(1800 SHP) MCP (1485 SHP)
* 3.22:1 RPM reduction btwn Nf/output shaft
* Oil <54.4 deg C bypasses cooling
* IGV failure closed, limit 35-40%
* Overspeed
	+ Ng: 105.8%
	+ Nf: 104 ≤91%Ng: 102 >91%Ng; 105% 3 sec
	+ Rotor: 105
* N1 Gearbox (SOFT)
	+ Starter Generator
	+ Oil pump
	+ FCU
	+ Tach/Gen
* N2 Gearbox (TOT)
	+ Torquemeter boostpump
	+ Overspeed Gov
	+ Tach/Gen
* **Powertrain**
* 5 min TOP(1290 SHP) MCP (1134 SHP)
* 20.4:1 reduction
* Oil <54.4 º C bypasses cooling
* 110 º C max oil temp
* 3 bypass (2 clogged, 1 thermal)
* Xmsn cases (top, main, planetary, support, sump)
* Xmsn accessories: main gen, Nr tach/gen, hyd pump
* **Rotor System**
* Semi-rigid seesaw type
* Tail rotor 90 º gearbox 2.6:1 reduction
* Mast bump @ 12 º
* Delta hinge 35 º off center trunnion
* 15% N1, blades turning
* slopes >5 º contact control stops
* 6 tail rotor drive shafts, one shorter than others
	+ 4 hangar bearings
* LTE factors (HIHALO)
	+ High gross weight
	+ Improperly rigged t-rotor
	+ High PA/temp
	+ Adverse winds
	+ Low N2/Nr rpm
	+ OGE hover
* LTRT may become uncontrollable below 60 KIAS
* **Avionics**
* 3 MFDs 6x8
* Primary ADC provides input to the transponder, but the secondary ADC is linked via GPS
* Wind info will not display if primary ADC fails
* Rad Alt info is provided below 2500 ft AGL
* Ampmeters have a 1 amp accuracy
* **Aerodynamics**
* ETL: 16-20 kts
* Airspeed unreliable< 20 kias due to downwash
* Vortex ring state: >800 fpm, <40 kts
* VNE: 130 kts
* VNE cabin doors open: 120 kts
* VNE Q>88%: 80 kts
* Sideward VNE: 35 kts
* Rearward VNE: 30 kts
* <50 kias 1 door open/1 closed
* 10 º slope sides and NH/ 7 º NL
* Start limit 30 knots/15 gust
* 2 types Turbulence:
	+ Orographic (wind 15/20 knots+ steep slope causes wind to blow off slope instead of down)
	+ Convective (norm<2000’ but up to 8000’)
* 3 types drag
	+ Parasite-nonlift surfaces
	+ Profile-blade surface
	+ Induced-lift producing surf
* Max glide distance is 84 knots at 94%Nr
* Min rate descent is 50 knots at 94% Nr
* **Maneuvers**
* All ops 500’ AGL except T/O, landing, training req
* SEF
	+ 700’ 60 kias
	+ 400’ recovery options
	+ Pow Recovery: climb by 200’ (250’ for >180

 deg turn) w/ 60 kias

* Autorotation
	+ RASP(R limits,a/s70 min, <3k fpm,pos 2 lnd)
	+ Aligned w/in 45º of wind if 15 knots, else 90º
	+ Hovering: wind w/in 15 º, 4’
	+ 180 Auto: 800’, aligned w/landing area 150’,

 80 kias in turn

* + St ahead: 500’ AGL, 90 kias, steady state by

 100’ AGL

* + Low Level: 50’ AHO, 40 KIAS descent
	+ > 180 º pow recovery by 250’
	+ Flare 75-100’
	+ Pow Recovery Termination: landing attitude 25’, pow pull 15-25’, term 4’ AGL 0-15
* Marginal Pow T/O: 4’ hov pwr, 50’ obst, term 50 kts
* Max Per T/O: Hov pow +10, 100’ obst, term 70 kias
* Slide on Landing: shallow app; TD 30 kias
* Traffic Pattern: DW 500’ AGL 90 KIAS; Base 300’ AGL 70 KIAS
* Hover 3-5’; Turn <90 º in 4 sec
* Unusual att: 30 º bank, 20 º NH, 10º NL
* Team sortie: wind limits 20 knots, gusts 10
* Steep app: start 30 kts ground/45 º apparent
* **Instruments**
* VOR needle +- 4
* Altimeter +- 75’ (11-217)
* Radar Alt 0’ +/- 5 on ground
	+ Set 25’ and test 50’+/-5
* Instrument Dep
	+ SID
	+ Obstacle Dep Proc
	+ Div Dep
	+ ATC (radar vectors)
	+ MAJCOM approved
	+ VCOA
* Weather to file:
	+ min for low compatible appch at dep airfield
	+ min for low compatible appch at dest airfield
	+ Can half vis no less than ¼ nm or 1200 RVR
	+ COPTER only can’t decrease vis
	+ Ceiling not required unless not straight in
	+ TEMPO does not apply
* Straight in
	+ course guidance can’t x centerline over rwy
	+ +/- 30 º of centerline
	+ <=500 fpm
* Alt necessary
	+ WX +/- 1 hr TEMPO or prevailing <700/1
	+ Weather reporting
	+ RADAR only
	+ Unmonitored navaids (A/NA)
	+ GPS only
* Airfield can be alt
	+ WX +/- 1 hr TEMPO or prevailing <700/1or 500/ ½ + lowest compatible whichever’s greater
	+ Weather reporting
	+ RADAR only
	+ Unmonitored navaids (A/NA)
	+ GPS only
	+ VFR exception:+/- 1 hr VFR descent from enr alt to appch/ldg
* MEA: MOCA + Min Rec Alt
* MCA: Min Crossing Alt
* MOCA: obstacle clearance
	+ 1000’ obstacle clnc w/in 5 nm, 2000’ mtns
* OROCA: same as MOCA but off route
* MEF: Max Elev Fig: Sectionals, MSL, highest obstacle in quadrangle
* Estalished: ½ full scale def ILS VOR, +-5º NDB
* **Weather**
* VFR requires 700’ ceiling, 2 sm vis
	+ Night/NVG, Xcountry, team: 1000/3
* Avoid thunderstorms 5 nm
* Special VFR recovery 300-1/2 day 500-1 night (CAIRNS)
* Class B: 3 sm, clear of clouds
* Class C/D/E below 10K: 3 sm, 500 below, 1000 above, 2000 horizontal
* Class E & G above 10K: 5 sm, 1000 below, 1000 above, 1000 horizontal
* Class G 1200-10K: Day 1 sm (Night 3 sm) 500 below, 1000 above, 2000 horizontal
* Class G below 1200: Day ½ sm (Night 1 sm) clear of clouds at a speed to see & avoid
* SVFR required for controlled airspace if <1000’ /3sm
* Cairns provide WW/TWA if wx w/in 15nm
	+ AWA if 60 nm
* NVG, return 30 min prior to fcst<1000/3
* Marginal VFR: 1000/3-3000/5
* Marginal IFR: <500/1
* **Navigation**
* 1000’ obstacle clnc w/in 5 nm, 2000’ mtns
* Mtns: 500’ in ½ nm
* TPC: 500’ contour/ 698’ obstacle error
* JOG: 100’ contour/ 298’ obstacle error
* 20 min nav, 3 TP, 60 deg turns or less, 20 nm max
* IP 3-12 nm 30 º turn or less
* Reaction time 3-4 sec
* **Remotes**
* Do no parallel power lines w/in ½ nm
* Plan ½ nm clear of known towers
* 300’ above the site High recon 50 KIAS min
* 50’ AHO Low recon 50 KIAS min
* 500’ slant range farm buildings/chicken houses
* 10’ min skid clearance
* Appch callouts above 300’ every 100’ below 300’ every 50’
	+ Alt, airspeed, *sink, torque*
* Appch monitor:
	+ VVI, Nr, Torque
* Bubble effect: veg, high DA, SKC=8-15 C
* Pow check: OGE+5% or a limit
* Pow margin< 10% recalc TOLD
* Unrest escape: OGE
* Rest escape: OGE+5%
* **Low Level**
* Cross ridgeline 45 º
* Don’t turn crosswind prior to 50 KIAS
* Downwind 100-200’AHO 80 KIAS
* 45 º bank: rotor tip below ldg gear
* L/L is 100’ AHO-300’ AGL
* Stay 200’ AHO over NOE boxes
* Make advisory calls to NOE boxes below 800’ MSL
* Call transient RT w/in ½ nm/below 800’ MSL
* Call inbound RT 2nm & ½ nm location, intentions, landing direction and traffic advisories
* **Formation**
* Primary purpose
	+ Mutual support/control
	+ Increased lift capacity
* Min separation 1 RD
* 5 acft max
* >3 acft consider 2 smaller elements
* Fluid Trail: 90º cone (45º either side)
* Fixed Trail: directly behind, stacked slightly high
* Staggered: Even # L/R 30-45º, Odd # behind 1
* Combat cruise: 500’min 3-9o’clock, 45 deg optimum
* Taxi: 100’ min spacing main rotor-tail rotor
* Wing T/O: 5 sec after radio call
* Delayed T/O: Norm delay 5 sec, lead: 70 KIAS 500 fpm
* Overshoot: 1000’ separation
* Lost wingman THAM-type, hdg, a/s, msa
* Lost Visual Non mountainous
	+ Turn 10\* position # º, 30 sec(after alt), MSA+2\*position#
* Lost Visual Mountainous
	+ Speed =prev acft-10 (3 min aft alt), MSA+2\*position#
* Lost visual contact: >=500 fpm climb
* **NVG**

LOP

* Must have chemlight/flashlight/reflective belt on
* Lights will be flash bright and NVG position lights will be on at all times the rotor is untied
* LDG light will be off outside corridors and RTs
* When calling tower at night, advise if you are aided
* Night refuel- student mush have on light
* NVG low level is 100’ AHO(150-200’ on the rad alt)
* Highbluff @ night is controlled by Lowe tower procedures are as follows: 100’ AHO timed route. OUTBOUND: 1900L-2230L. Call Lowe tower UHF for clearance, Call OZR tower for T/O INBOUND: 2230L-0100L. Call OZR tower @ Claybank on VHF, call Lowe tower @ Clayhatchee
* If you PL: Mark the A/C with chemsticks on the tail and nose. (If no tape is available, place stick between windshield & glare shield and attach the other chemstick to the rotor tie-down.) Annotate chemstick placement on the 781A.

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* Unaided
	+ Night VFR decent mandatory PNF calls: 1000’ above, 500’ above, 100’ above, altitude
	+ Do not descend below 300 AGL until established on approach
	+ At 200’AGL you should have a 30knot GS, the last 100’ should be limited to 300fpm
	+ Minimum LZ size is 3 rotor diameters
	+ Obstacles/terrain within 3NM will not exceed 200 ft above site elevation
* NVG
	+ Entire crew is either on or off goggles(If one crew member is off, you must comply with unaided procedures)
	+ NVGs work best above 5% EMI
	+ Clear moonless nights with average starlight provides 8% illumination
	+ Do not conduct training with less than 5% EMI
	+ Minimum altitude is 100ft AGL (NVG low-level routes can be 50’AHO)
	+ Anti-collision may be extinguished and position lights turned to dim during terminal ops if they interfere with the pilot
	+ Formation: Lead=steady dim Trail= Steady bright & anti-collision
	+ An operable searchlight or LDG light with an infrared filter is required for NVG operation below 20% EMI and highly recommended for all NVG flights
	+ Preflight procedures are found in TO 12S10-2AVS9-2
	+ Power lines, unlit towers, poles, and dead trees are difficult to see, it is recommended to use a lower altitude to highlight these objects
	+ Adverse weather may appear further away
	+ You have degraded depth perception on goggles

217V3

* Cone cells:
	+ Day, color, centered at fovea
* Rod Cells
	+ Night, low-light, gray, outside fovea
	+ Require rhodopsin (most inc in first 30 min)
* Focal vision: central 2 degrees
* Ambient vision (peripheral): subconscious, special orientation
* Dark adaptation: 30-45 min norm
	+ Bright light >1 sec impair night vision
	+ Recovery 5-45 min
	+ After NVG recovery 5-8 min
* Types of vision
	+ Photopic: cone cells, color
	+ Scotopic: rod cells, poor resolution, loss of color
	+ Mesopic: intermediate photopic/scotopic
* Visible light 400-700 nm
* NVGs visible and near IR (700-900nm)
* Illuminance: light strikes object
* Luminance: light reflected
* Albedo: ratio light strike/reflected
* Contrast: luminance difference of 2 objects
* Moon primary source of natural illumination
	+ Depends on moon angle/lunar phase
* Lunar month approximately 29 days
* Stars provide 20% illuminance moonless night
* Skyglow: 1 ½ hrs after sunset/ ½ hr prior sunrise
* Ionization provides 40% illuminance moonless night
* Components image intensifier tube
	+ Objective lens: focus photons onto photocathode
	+ Minus Blue filter
	+ Photocathode: starts intensification process
	+ Microchannel plate: 1 e in ->1000 out
	+ Phosphor screen: converts e visible light
	+ Fiberoptic inverter: reorients image
	+ Diopter lens: focuses image onto retina
* Gain: ratio input/output, controlled by ABC
* NVG field of view 40 º
* Field of regard: specific to aircraft
* Binocular cues: up to 200 m
	+ Stereopsis, vergence, accommodation
* Monocular cues
	+ Size constancy, motion parallax, linear perspective
* Dynamic Visual Cues
	+ Static cue motion, Optical flow, Peripheral vision motion
* Circadian Trough between 0300-0600
* Fatigue types: acute, cumulative, circadian
* 6º civil twilight
* 12º nautical twilight
* 18º astro twilight
* EENT: End of Evening nautical twilight