This was found in a
DTIC document available
on the public internet titled:

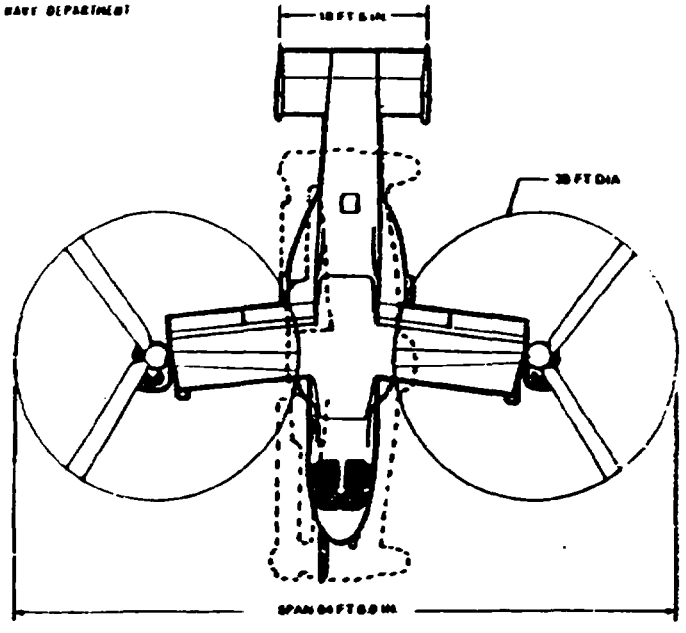
"The V-22 Osprey: A Case Analysis"
by Mark O'Brien
Naval Postgraduate School

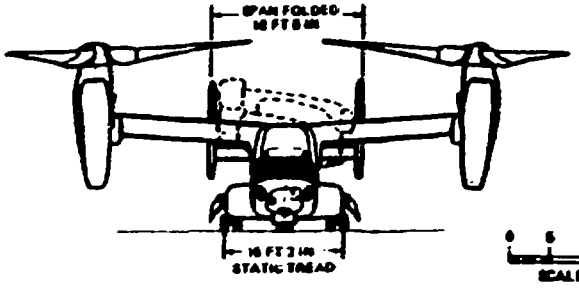
STANDARD AIRCRAFT CHARACTERISTICS

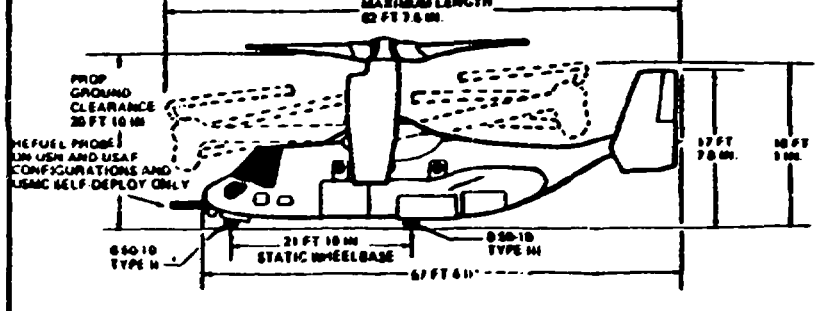
MV-22 "OSPREY"
BELL-BOEING

NAVAIR document 00-110AV-22-1 dated June 1986

NAVAL AIR SYSTEMS COMMAND
NAVY DEPARTMENT



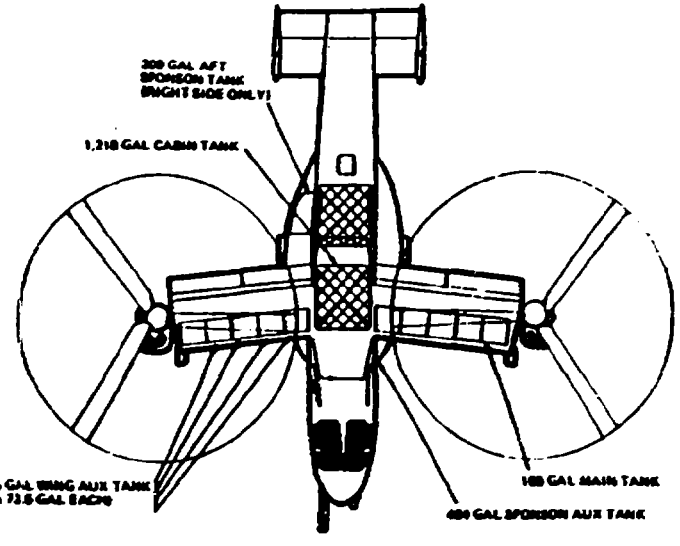


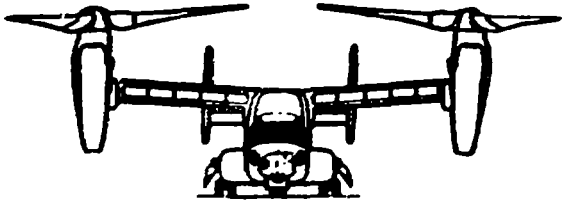


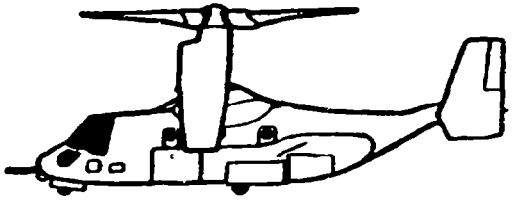
DESCRIPTIVE ARRANGEMENT

NAVAL AIR SYSTEMS COMMAND
NAVY DEPARTMENT

Revision A







NOTE ALL CONFIGURATIONS CARRY 300 GAL CABIN TANKS (-) ON SELF DEPLOY ONLY

NONSELF SEALING, CRASHWORTHY, NON INERTED

ARRANGEMENT AND FAIRLEAD

POWER PLANT

No. & Model:	2 T406-AD-400
Manufacturer:	Allison Gas Turbine Division
Engine Spec No.:	937 (Fourth Draft) 22 July 85
Type:	Turboshaft

RATINGS

	SHP	RPM	ALT
Maximum	6150*	15,000	Sea Level, 59°F
Intermediate	6150*	15,000	Sea Level, 59°F
Maximum Continuous	5088	15,000	Sea Level, 59°F
Transmission Limits:	3521**	12,575	Cruise rpm
	4200**	15,000	USMC
*Engine Torque Limit 2,153 ft-lb	4570**	15,575	USN, USAF
	5620	15,575	OEI

Exhaust Nozzle Area 317 in.^{2}

**RHP

ELECTRONICS

VHF/UHF Radio AN/ARC 182	Radar Beacon APX-78	Inertial Nav System SKN-2443 (CFE)
VHF/UHF Encryption KY 58	Radar Warning APR-39A	Mission Computers AYK-14 (XN-6)
VHF/UHF Control Head C-10319A	Missile Warning AAR-47	Interface Units (CFE)
MF Radio ARC-190 ARC-190	Chaff Flare/ Jammer Dispenser ALE-39	VSLED (CFE)
HF Encryption ANDVT	SAHRS USN-2	DTS (CFE)
IFF APX-100	Tacan ARN-118	UFD (CFE)
IFF Security Kit 1A TSEC	VOR/ILS MB ARN-144	DEU (CFE)
Intercom AIC-30 (CFE)	Doppler APN-217	CDU (CFE)
FM Homing (CFE)	Cara APN-232	HMD (CFE)
Digital Message Device OA-8990	VHF/UHF ADF OA-8987	Multifunction Radar (CFE)
		Night Vision Goggles (CFE AN/AVS-6)

MISSION AND DESCRIPTION

The V-22 is a multimission aircraft designed for use by all services. The unique ability of the tiltrotor to combine VTOL operations with high altitude and high airspeed flight permits such multimission applications.

The U.S. Marine Corps will use the V-22 for Vertical Assault Transport of troops, equipment and supplies from amphibious assault ships and land bases.

The U.S. Navy will use the V-22 for combat search and rescue, delivery and retrieval of special warfare teams, and logistics transportation in support of the fleet.

The U.S. Air Force will use the V-22 for long range special operations missions, delivering and retrieving U.S. Army special forces troops and equipment at mission radii in excess of 500 NM.

The U.S. Army will use the V-22 for aero medical evacuation, special forces infiltration and exfiltration and long range assault logistics support.

The V-22 Osprey is a tiltrotor aircraft with two 38 foot rotor systems and engine/transmission nacelles that are mounted on each wing tip. These rotor systems are powered by two T406-AD-400 engines. The aircraft operates as a helicopter when taking off and landing vertically. Once airborne the nacelles are rotated 90 degrees forward thus converting the aircraft into a turboprop airplane for high-speed, fuel-efficient flight. The rotors are synchronized by means of an interconnect transmission shaft that runs through the wing between the two nacelle mounted transmissions. This shaft also provides power transmission from one rotor system to the other in case of an engine failure.

The aircraft folds up compactly for stowage aboard ship. This is accomplished by folding the rotor blades inboard in front of the wing then outboard, the wing so as parallel to the fuselage.

The V-22 airframe is almost completely composite construction. It has crashworthy seating for combat troops, two external cargo hooks for carriage of outsized equipment, a rescue hoist, a cargo winch and pulley system of loading and unloading heavy internal cargo loads and an aft loading ramp which permits quick egress and exit of both troops and cargo.

The Osprey is capable of all weather instrument flight, day or night, and continuous operation in moderate icing conditions. The Navy and Air Force aircraft are equipped to fly in these same conditions at very low level.

Although all services use a common aircraft, the Marine Corps and Army designation is MV-22A, the Air Force designation is CV-22A and the Navy designation is HV-22A.

DEVELOPMENT

First Flight (estimated)	1988
Service Use (estimated)	1991

DIMENSIONS

Main Rotor

Diameter:	38 ft
Disk Area:	2,268 ft^2
Blade Area:	261.52 ft^2
No. of Blades:	3 per rotor

Length		Height		Width	
Maximum:	688 inches	Maximum:	261 inches	Maximum:	1,014.9 inches
Folded:	751 inches	Folded:	217 inches	Folded:	221 inches
				Track:	182.6 inches

WEIGHTS

Revision A

Loading	(USMC) Weight (lb)	Load Factor Airplane	Load Factor Helicopter
Empty	31,818		
Operating	32,823		
Design	39,500	+4.0, −1.0	+3.0, −.5
Combat	42,712	+3.7, −.92	+2.77, −.46
Max Takeoff (VTO)	47,500	+3.3, −.84	+2.5, −.42
Max Takeoff (STO)	55,000	+2.87, −.72	
Self-Deployment (STO)	60,500	+2.61, −.65	

FUEL AND OIL

FUEL

Gal.	No. & Type of Tanks	Location
2,438	2 Non Self-Sealing	Cabin (Self-Deployment)
926	2 Partial Self-Sealing	Sponsons
180	2 Self-Sealing	Wing
588	6 Self-Sealing	Wing
300	1 Partial Self-Sealing	Aft Sponson

Fuel Grade JP-4/JP-5/JP-8

Fuel Spec MIL-T-5624

OIL

Engine (gal)	1.93	Spec: DOD-L-85734
Transmission (gal)	26.376	Spec: DOD-L-85734

ORDNANCE

Provisions for Two (2) .50 Caliber Cabin Guns.
Additional Provision for Ramp Mounted Gun (USAF only)

ACCOMMODATIONS

Crew (mission)	3
Cabin Size Clearance	
Length:	280 inches
Width:	71 inches
Height:	72 inches
Usable Volume:	868 ft^3
Rescue Hatch Dimensions:	40 inches x 29 inches
Provision for Troop Seats:	24
Provision for Litters:	12
Rescue Hoist Capacity:	600 lb
Cargo Hook Capacity:	15,000 lb
Cargo Floor Limit:	300 psf
Max Cargo Weight:	20,000 lb

PERFORMANCE SUMMARY (STANDARD DAY CONDITIONS)

Revision A

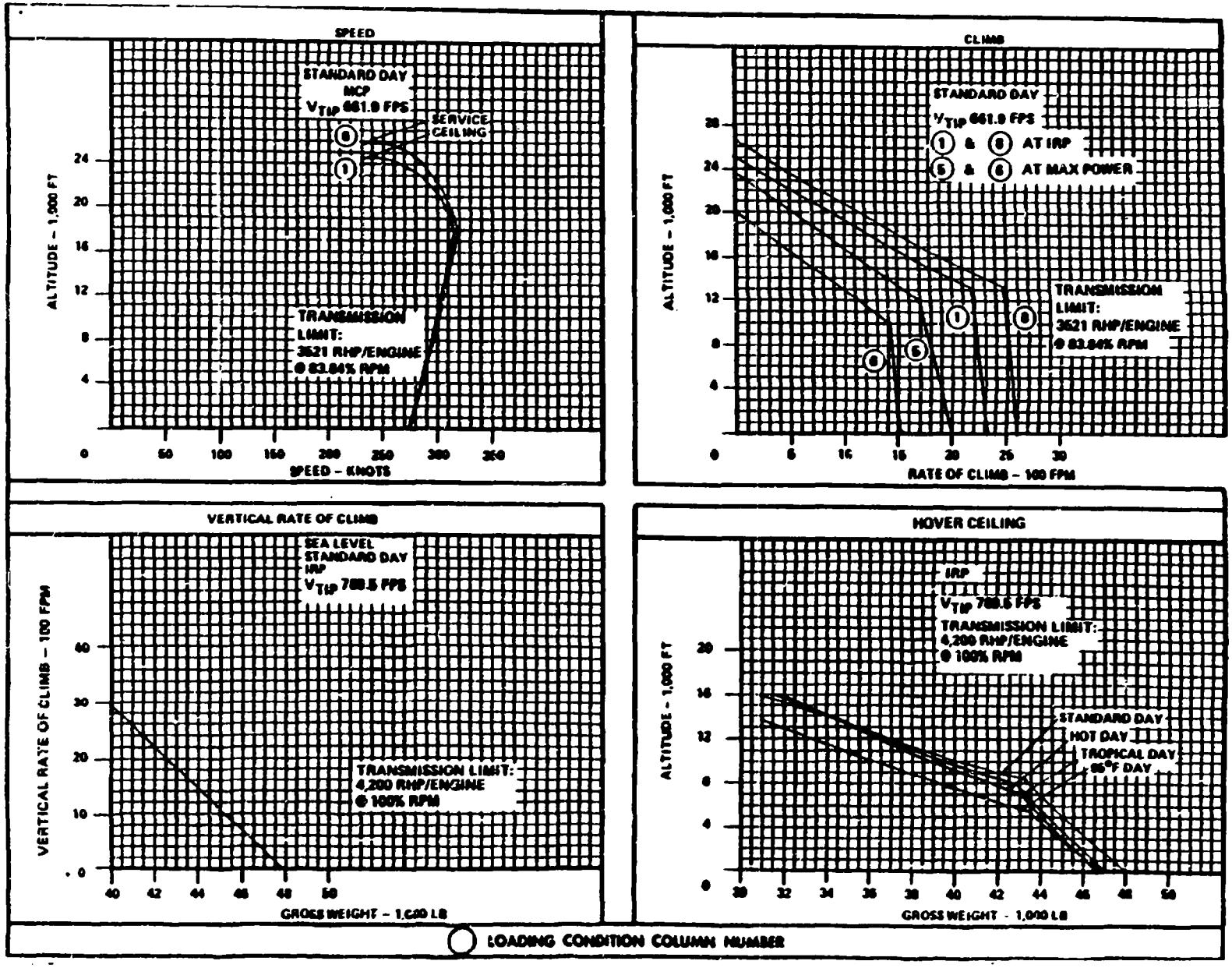
TAKE-OFF LOADING CONDITION		Amphibious Assault (Troops) ①	Amphibious Assault (Cargo) ②	Land Assault (Troops) ③	Land Assault (Cargo) ④	Combat Search and Rescue ⑤	Special Operations (A) ⑥	USMC Self-Deployment ⑦
TAKE-OFF WEIGHT (E)	lb.	46,021	44,268	44,767	44,081	47,921	53,566	60,500
*Fuel internal/external (JP-5) (6.8 lb/gal)	lb./lb.	6,838	3,536	6,584	3,338	13,368	16,367 (A)	26,119
Payload	lb.	5,760	8,300	5,760	8,300	880	2,880	0
Disc loading	lb./sq. ft.	19.8	19.5	19.7	19.4	21.1	23.6	26.7
Vertical rate of climb at SL /Std	fpm.	1 090 (F)	1,340 (F)	(F)	1,410 (F)	1,000 (B)	NA	NA
Absolute hovering ceiling (OGE Std)	ft.	5,000 (F)	6,500 (F)	5,500 (F)	6,800 (F)	4,400 (B)	NA	NA
Max. rate of climb at SL/Std (H)	fpm.	2,320	2,400	2,350	2,420	2,030	1,490	1,090
Service ceiling (G)	ft.	24,680	24,930	24,680	25,020	23,110	20,180	17,950
Speed at S.L. (H)	kn.	273	274	274	274	272	268	264
Max. speed/altitude (Std Day) (H)	kn./ft.	315/18,000	315/18,000	315/18,000	315/18,000	314/17,000	306/16,500	294/16,000
O.E.I. Service ceiling (G)	ft.	11,300	11,600	11,450	11,900	9,350	5,750	S.L. (B)
Min. speed (O.E.I.) (B) (C)	kn.	38	37	38	37	46	63	90
Max. speed (O.E.I.) (B) (C)	kn.	231	232	231	233	228	221	202
Combat radius	n. mi.	2 x 50	50	200	50	480	520	NA
Mission time	hrs.	1.84	0.675	2.01	0.710	4.0	4.6	NA
Average cruising speed	kn.	274	170	245	170	244	251	NA
Cruising altitude	ft.	3,000	3,000	3,000	3,000	2,000	1,000	NA
Range/Mission Time nms/hours		515/2.21	109/.63	495/2.20	101/.78	1,020/4.24	1,115/4.47	2,100/7.92
Average cruising speed	kn.	233	130	225	130	241	249	264
Cruising altitude	ft.	3,000	3,000	3,000	3,000	2,000	1,000	12,000-25,000
Maximum endurance	hrs.	2.60	.83	2.50	.76	5.20	5.80	10.01
Endurance speed	kn.	176	130	174	130	171	178	223/170
Endurance altitude	ft.	3,000	3,000	3,000	3,000	2,000	1,000	10,000
Combat Loading Condition ⑧		60% fuel		60% fuel		60% fuel	60% fuel	
Combat Weight	lb.	42,488		42,333		42,773	47,699	
Engine Power		MCP		MCP		MCP	MCP	
Fuel	lb.	4,193		3,950		8,021	8,220	
Combat Speed/Cruise Altitude (D) (H)	kn./ft.	284/3,000		284/3,000		280/2,000	276/1,000	
Rate of Climb/Cruise Altitude (D) (H)	fpm./ft.	2,570/3,000		2,580/3,000		2,580/2,000	2,020/1,000	
Combat Ceiling (500 fpm) (G)	ft.	22,200		22,400		23,700	20,800	
Rate of Climb at SL/STD (H)	fpm.	2,600		2,620		2,600	2,030	
Max. speed at SL/Std (H)	kn.	275		275		276	272	
Max speed/altitude-time airspeed (H)	kn./ft.	318/18,000		318/18,000		318/18,000	314/17,000	
Landing Weight		33,615		33,584		38,000	39,026	37,193
Fuel	lb.	992		981		1,337	1,537	2,612
Absolute hovering ceiling (OGE)	ft.	14,200 (F)		14,240 (F)		12,900 (B)	10,200 (B)	11,900 (F)

NOTES

PERFORMANCE BASIS: ESTIMATED DATA GUARANTEE LEVELS OF PERFORMANCE (SD-572-1) AND ENGINE SPECIFICATION FUEL FLOWS

*WING AUXILIARY FUEL TANKS ARE USMC MISSION ROLE EQUIPMENT

(A) JP-4 FUEL (6.5 LB/GAL)
(B) MAX POWER
(C) SEA LEVEL
(D) MISSION CRUISE ALTITUDE
(E) ADD 200 LB OF TAXI/WARM UP FUEL TO OBTAIN RAMP WT
(F) IRP
(G) MCP
(H) XMSN LIMIT: 3621 RHP/ENG @ CRUISE RPM (V_{TIP} = 661.9 FPS)


SPEED
STANDARD DAY
MCP
V_{TIP} 661.9 FPS
SERVICE CEILING
TRANSMISSION LIMIT:
3521 RHP/ENGINE
@ 83.84% RPM
ALTITUDE - 1,000 FT
SPEED - KNOTS
CLIMB
STANDARD DAY
V_{TIP} 661.9 FPS
AT IRP
AT MAX POWER
TRANSMISSION LIMIT:
3521 RHP/ENGINE
@ 83.84% RPM
ALTITUDE - 1,000 FT
RATE OF CLIMB - 100 FPM
VERTICAL RATE OF CLIMB
SEA LEVEL
STANDARD DAY
IRP
V_{TIP} 788.5 FPS
TRANSMISSION LIMIT:
4,200 RHP/ENGINE
@ 100% RPM
VERTICAL RATE OF CLIMB - 100 FPM
GROSS WEIGHT - 1,000 LB
HOVER CEILING
IRP
V_{TIP} 788.5 FPS
TRANSMISSION LIMIT:
4,200 RHP/ENGINE
@ 100% RPM
STANDARD DAY
HOT DAY
TROPICAL DAY
95°F DAY
ALTITUDE - 1,000 FT
GROSS WEIGHT - 1,000 LB
LOADING CONDITION COLUMN NUMBER

NOTES

MISSION DEFINITIONS

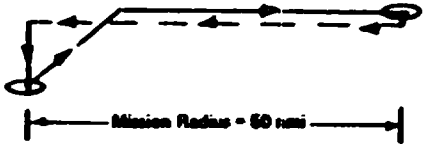
(1) AMPHIBIOUS ASSAULT, TROOP LIFT (USMC)

Takeoff:	Warmup/idle 10 minutes, VTO ● SL/103°F (1 minute IRP)
Loiter:	Loiter 40 minutes ● V_{BE}
Climb:	Climb to 3,000 ft ● IRP
Cruise:	Cruise to mission radius ● V_{BR}
Maneuver:	5 minutes ● IRP
Hover:	HOGE/land ● 3,000 ft/91.5°F (2 minutes ● IRP), drop P/L, VTO ● 3,000 ft/91.5°F (1 minute ● IRP)
Maneuver:	5 minutes ● IRP
Cruise:	Cruise back ● V_{BR}
Descent:	Descend to sea level (no fuel used, no distance credit)
Loiter:	Loiter 15 minutes ● V_{BE}
Hover:	HOGE/land ● SL/103°F (2minutes ● IRP), pick up P/L, VTO ● SL/103°F (1 minute ● IRP)
Climb:	Climb to 3,000 ft ● IRP
Cruise:	Cruise to mission radius ● V_{BR}
Hover:	HOGE/land ● 3,000 ft/91.5°F (2 minutes ● IRP), drop P/L, VTO ● 3,000 ft/91.5°F (1 minute ● IRP)
Cruise:	Cruise back ● V_{BR}
Descent:	Descend to sea level (no fuel used, no distance credit)
Reserve:	30 minute sea level loiter ● V_{BE} or 10% initial fuel, whichever is greater

⬭ Hover symbol (HOGE, VTO/land, maneuver)

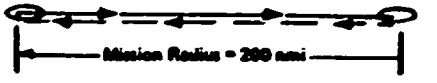
(2) AMPHIBIOUS ASSAULT, EXTERNAL CARGO LIFT (USMC)

Takeoff:	Warmup/idle 10 minutes, VTO ● SL/103°F (1 minute ● IRP)
Climb:	Climb to 3,000 ft ● IRP
Cruise:	Cruise to mission radius (speed not to exceed 130 kts)
Hover:	HOGE ● 3,000 ft/91.5°F (2 minutes ● IRP), drop P/L
Maneuver:	5 minutes ● IRP
Cruise:	Cruise back ● V_{BR}
Descent:	Descend to sea level (no fuel used, no distance credit)
Reserve:	30 minute sea level loiter ● V_{BE} or 10% initial fuel, whichever is greater



(3) LAND ASSAULT, TROOP LIFT (USMC)

Takeoff:	Warmup/idle 10 minutes, VTO ● 3,000 ft/91.5°F (1 minute ● IRP)
Cruise:	Cruise to mission radius ● V_{BR}
Hover:	HOGE/land ● 3,000 ft/91.5°F (2 minutes ● IRP) Drop P/L, VTO ● 3,000 ft/91.5°F (1 minute ● IRP)
Maneuver:	10 minutes ● IRP
Cruise:	Cruise back ● V_{BR}
Reserve:	30 minute sea level loiter ● V_{BE} or 10% initial fuel, whichever is greater



◯ LOADING CONDITION COLUMN NUMBER

NOTES

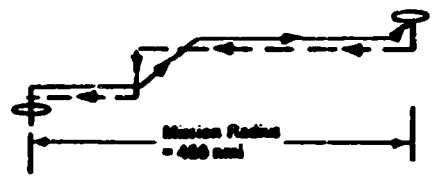
MISSION DEFINITIONS

(4) LAND ASSAULT, EXTERNAL CARGO LIFT (USMC)

Takeoff:	Warmup/idle 10 minutes, VTO ● 3,000 ft/91.5°F (1 minute ● IRP)
Cruise:	Cruise to mission radius (speed not to exceed 130 kts)
Hover:	HOGE ● 3,000 ft/91.5°F (2 minutes ● IRP), drop P/L
Maneuver:	5 minutes ● IRP
Cruise:	Cruise back ● V_{BR}
Reserve:	30 minutes sea level loiter ● V_{BE} or 10% initial fuel, whichever is greater

(5) COMBAT SEARCH AND RESCUE (USN)

Takeoff:	Warmup/idle 10 minutes, VTO ● SL/103°F (1 minute ● max power)
Cruise:	Cruise ● V_{BR} (500 ft AGL)
Climb:	Climb to 2,000 ft ● IRP
Cruise:	Cruise ● V_{BR} to mission radius
Climb:	Climb to 3,000 ft ● IRP
Hover:	HOGE ● 3,000 ft/91.5°F (7.5 minutes ● max power) Pick up P/L, HOGE (7.5 minutes ● max power)
Descent:	Descend to 2,000 ft (no fuel used, no distance credit)
Cruise:	Cruise back ● V_{BR}
Descent:	Descend to 500 ft AGL (no fuel used, no distance credit)
Cruise:	Cruise back ● V_{BR}
Reserve:	30 minutes sea level loiter ● V_{BE} or 10% initial fuel, whichever is greater



(6) LONG RANGE SPECIAL OPERATIONS (USAF)

Takeoff:	Warmup/idle 10 minutes, STO* ● SL/103°F
Cruise:	Cruise ● V_{BR}
Climb:	Climb to 1,500 ft ● IRP
Cruise:	Cruise to mission radius ● V_{BR}
Climb:	Climb to 4,000 ft ● IRP
Hover:	HOGE ● 4,000 ft/95°F (5 minutes ● max Power)
Descent:	Descend to 1,000 ft (no fuel used, no distance credit)
Cruise:	Cruise back ● V_{BR}
Descent:	Descend to sea level (no fuel used, no distance credit)
Cruise:	Cruise back ● V_{BR}
Reserve:	30 minutes sea level loiter ● V_{BE} or 10% initial fuel, whichever is greater

*STO is 2,000 ft maximum distance to clear 50 ft obstacle

JP-4 fuel shall be used for the USAF LRSOF mission

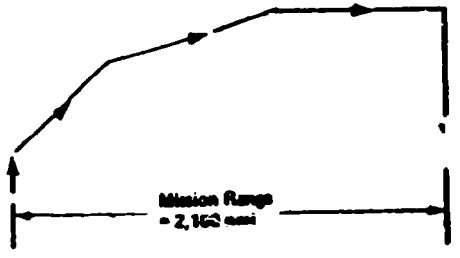
○ LOADING CONDITION COLUMN NUMBER

NOTES

MISSION DEFINITIONS

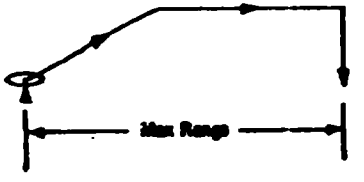
(7) SELF-DEPLOYMENT

Takeoff:	Warmup/idle 10 minutes, STO ● SL/90°F at max power
Climb:	Climb to best cruise altitude ● IRP
Cruise:	Cruise/climb to 25,000 ft ● V_{BR}
Cruise:	Cruise to maximum range ● V_{BR}
Reserve:	10% of initial fuel



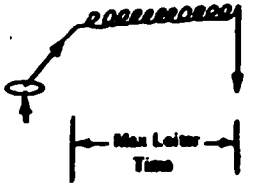
(8) RANGE MISSION

Takeoff:	Warmup/idle 10 minutes, VTO (STO for USAF) ● mission altitude/ambient (2 minutes ● IRP)
Climb:	Climb to mission cruise altitude ● IRP (no climb for land assault missions)
Cruise:	Cruise ● V_{BR}
Reserve:	20 minutes sea level loiter ● V_{BE} or 10% initial fuel, whichever is greater



(9) ENDURANCE MISSION

Takeoff:	Warmup/idle 10 minutes, VTO (STO for USAF) ● mission altitude/ambient (2 minutes ● IRP)
Climb:	Climb to mission cruise altitude (no climb for land assault missions)
Loiter:	Loiter ● V_{BE}
Reserve:	20 minutes sea level loiter ● V_{BE} or 10% initial fuel whichever is greater



○ LOADING CONDITION COLUMN NUMBER