

LUNAR MODULE WEIGHT PRESENTATION TO
SCIENCE AND TECHNOLOGY ADVISORY COMMITTEE

OCTOBER 6-8, 1967

MR O E MAYNARD

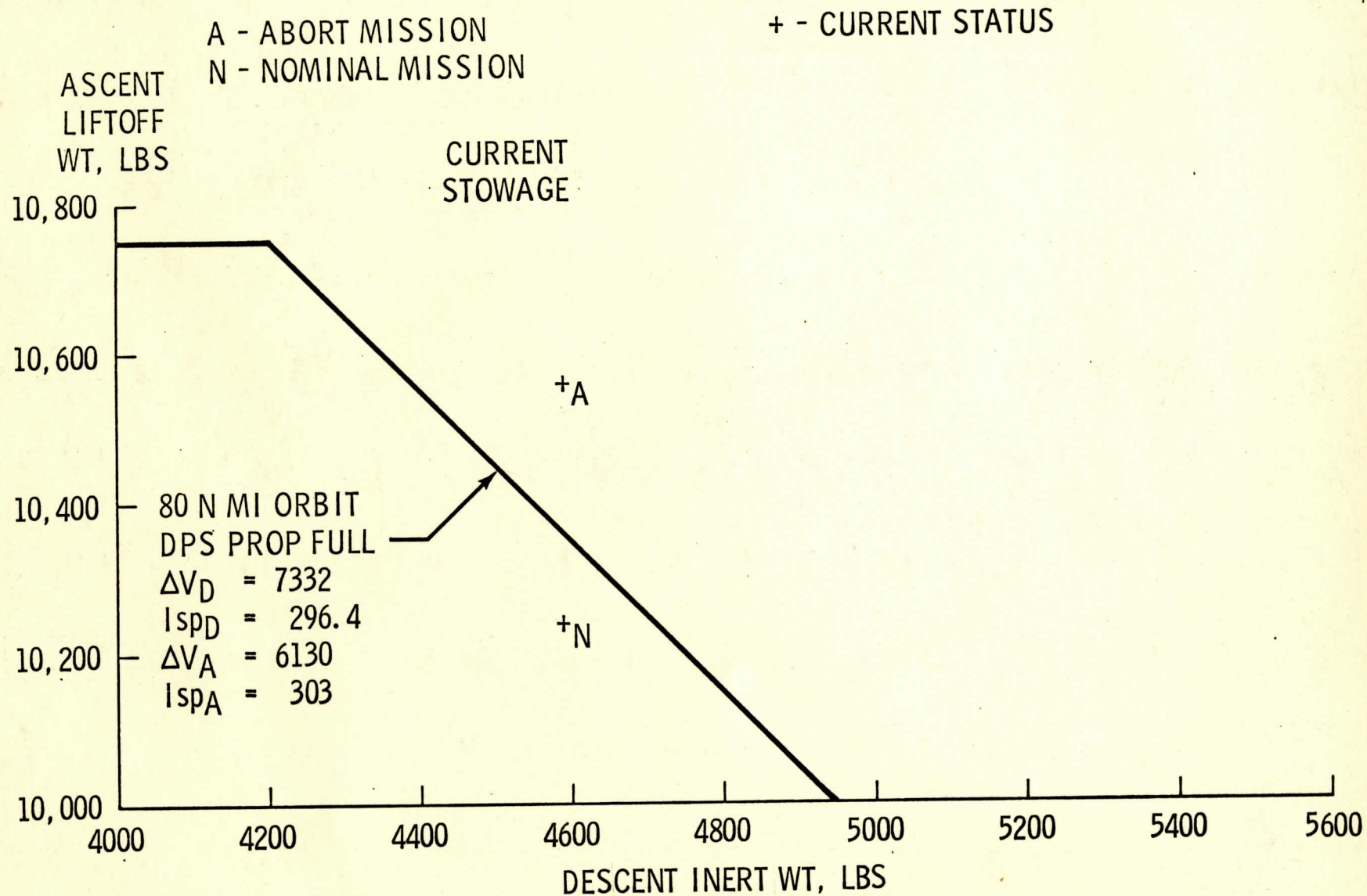
LM WEIGHT

- NOMINAL LUNAR LAUNCH WEIGHT AND ABORT WEIGHT
 - NO SIGNIFICANT Δ WT BETWEEN ASCENT NOMINAL AND ABORT - EXCLUSIVE OF STOWABLES
 - OFFLOADING OF STOWABLES ON SURFACE RESULTS IN ABORT Δ WT (+180 TO +76)
- WEIGHT-MISSION DESIGN
- WEIGHT-PERFORMANCE

WEIGHT SUMMARY
 NOMINAL LUNAR MISSION CURRENT STATUS
 SEPTEMBER 29, 1967

ASCENT STAGE	4,827	EARTH LAUNCH WT
RCS PROPELLANT	510	571 USABLE CAPACITY
APS PROPELLANT	4,797	5019 USABLE CAPACITY
DESCENT STAGE	4,587	EARTH LAUNCH WT
DPS PROPELLANT	17,501	17,510 USABLE CAPACITY
TOTAL SEP - WT	32,654	
TOTAL EARTH LAUNCH	32,200	32,000 LIMIT WT

DESCENT INERT VS ASCENT LIFTOFF WEIGHT



WEIGHT NORMALLY JETTISONED ON LUNAR SURFACE

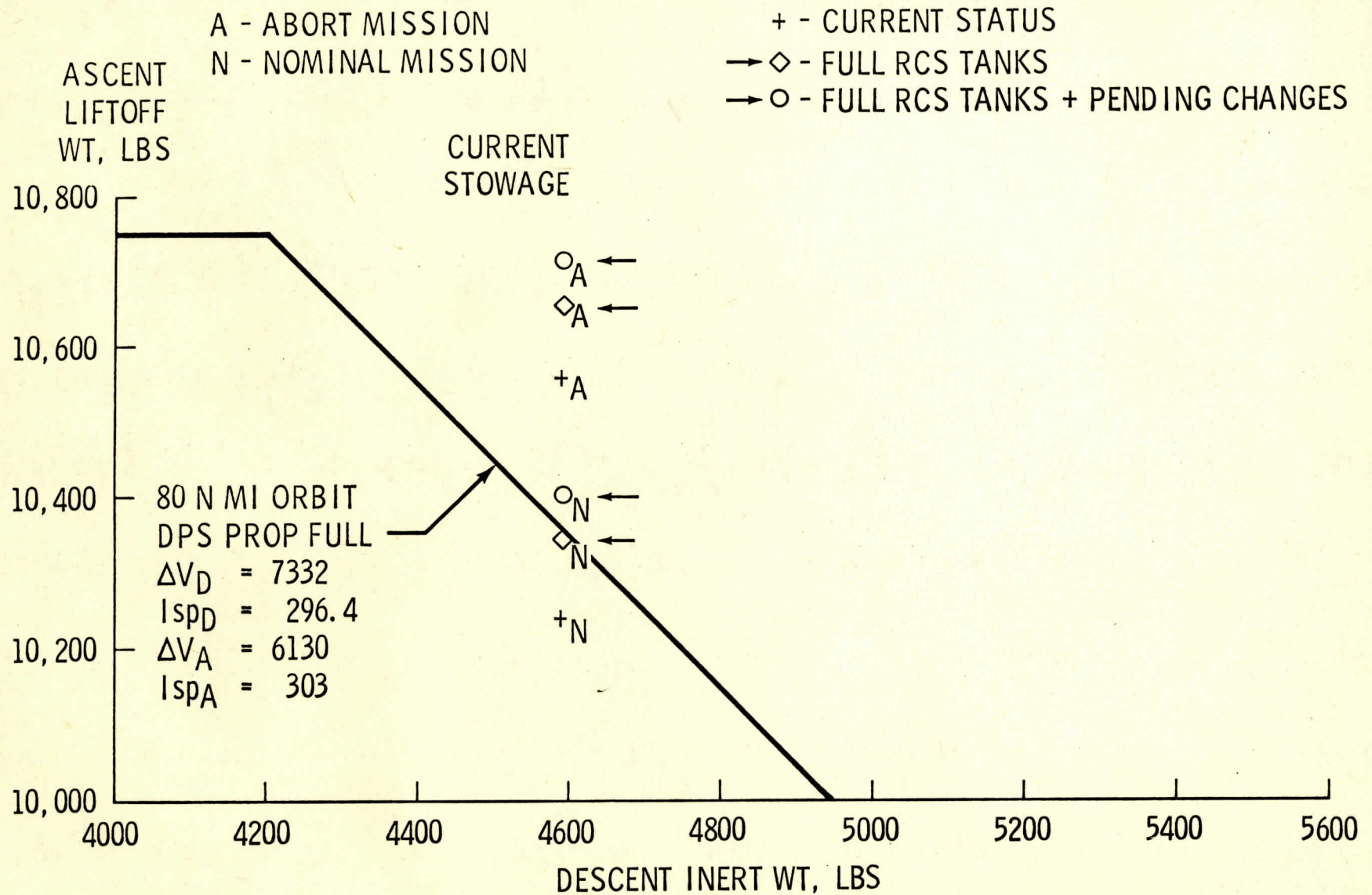
CFE HDWE	- 9.1
PLSS (2)	- 150.2
LiOH CANISTERS (4)	- 20.0
EV BOOTS (2 PAIR)	- 9.4
FOOD	- 7.0
EMU MAIN KIT	- .4
TV SYSTEM	- 14.6
CAMERA AND EQUIPMENT	- 10.2
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	- 220.9*

WEIGHT NORMALLY ADDED TO ASCENT

LUNAR SAMPLES + 41.0*

* 180 LB ASCENT STAGE PENALTY FOR ABORT MISSION

DESCENT INERT VS ASCENT LIFTOFF WEIGHT



PENDING LM CHANGES

ASCENT STAGE

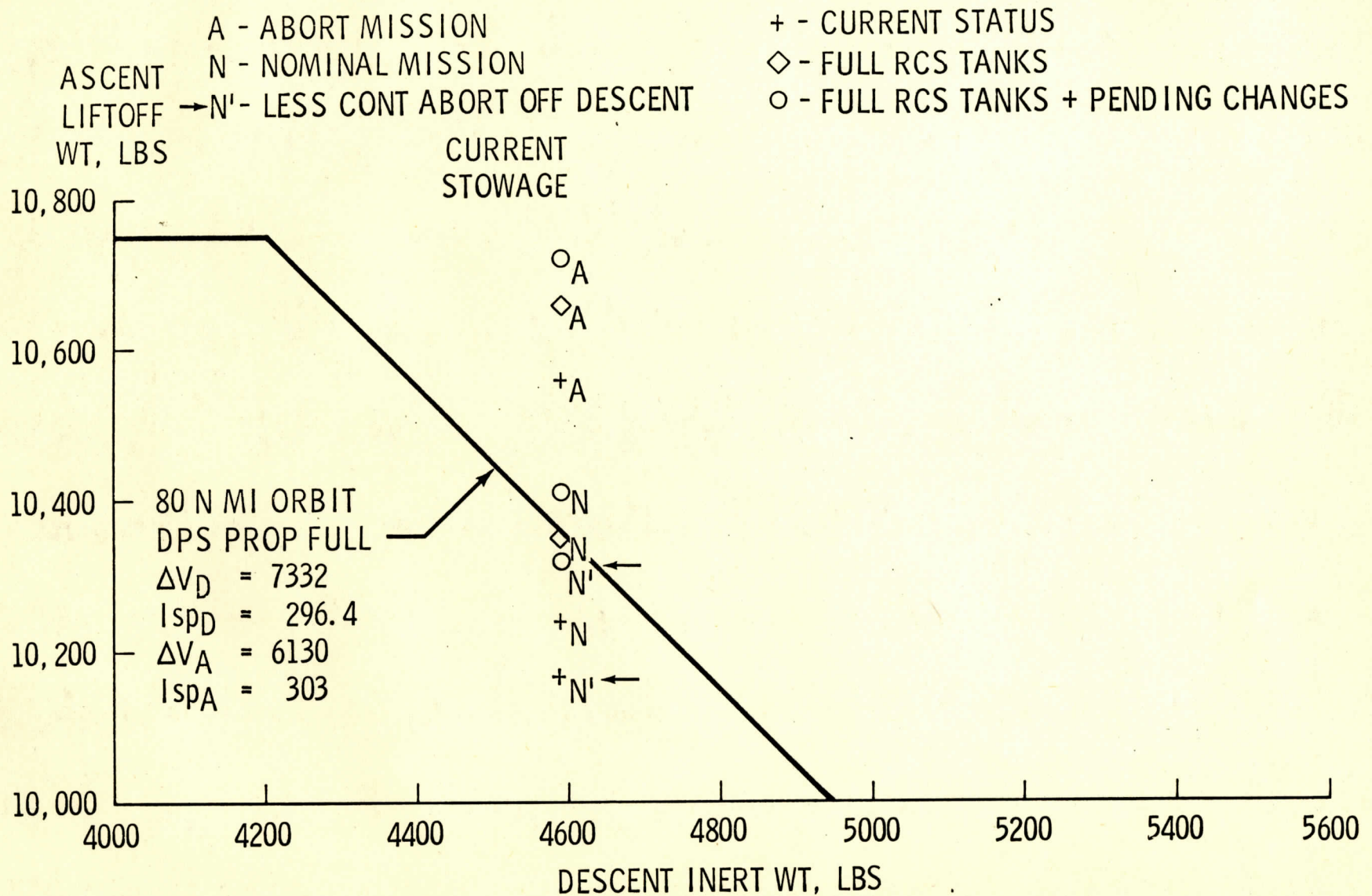
STRUCTURE MOUNTING FOR OPS / PLSS STOWAGE	+ 7
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EV VISORS, GLOVES AND EMU MAINTENANCE KIT	+ 13
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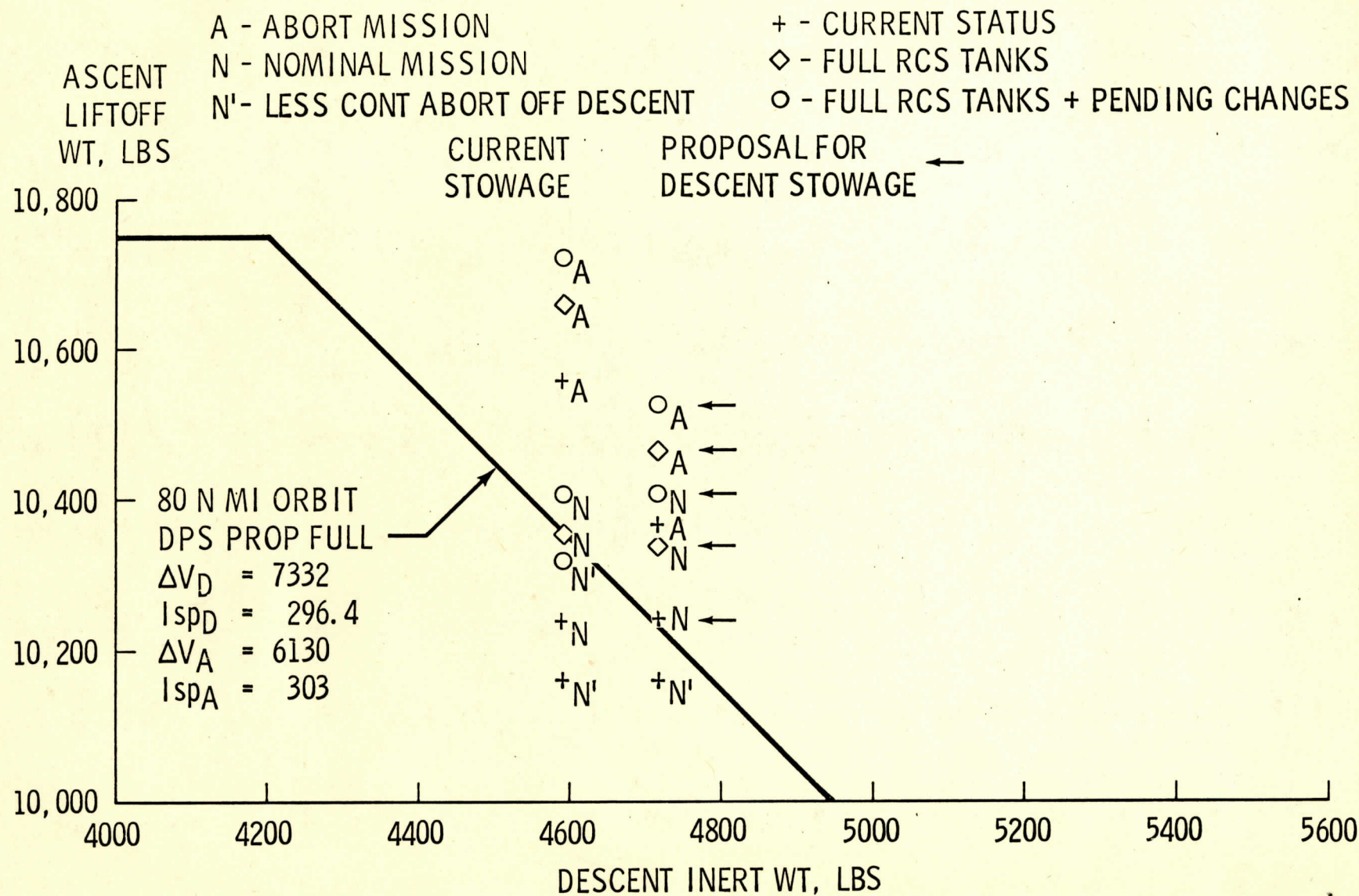
CAMERA CONFIGURATION CHANGES	<u>+ 16</u>
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DESCENT INERT VS ASCENT LIFTOFF WEIGHT



DESCENT INERT VS ASCENT LIFTOFF WEIGHT



POSSIBLE DESCENT STAGE STORAGE MODIFICATIONS

ADDITIONAL ITEMS STOWED IN DESCENT STAGE
WHICH WERE IN ASCENT

SAMPLE RETURN CONTAINERS	+ 40.0
TV SYSTEM	+ 14.6
LiOH RECHARGES (4)	+ 20.0
FOOD	+ 4.4
CAMERA AND EQUIPMENT	+ 15.7
CFE HDWE	+ 9.1
	<hr/> 103.8
STRUCTURAL PENALTY	+ 30.0

WEIGHT NORMALLY JETTISONED ON LUNAR SURFACE

CAMERA EQUIPMENT	- 4.0
PLSS (2)	- 150.2
EV BOOTS (2 PAIR)	- 9.4
FOOD	- 2.6
EMU MAINTENANCE KIT	- .4
	<hr/> 166.6*

WEIGHT NORMALLY ADDED TO ASCENT

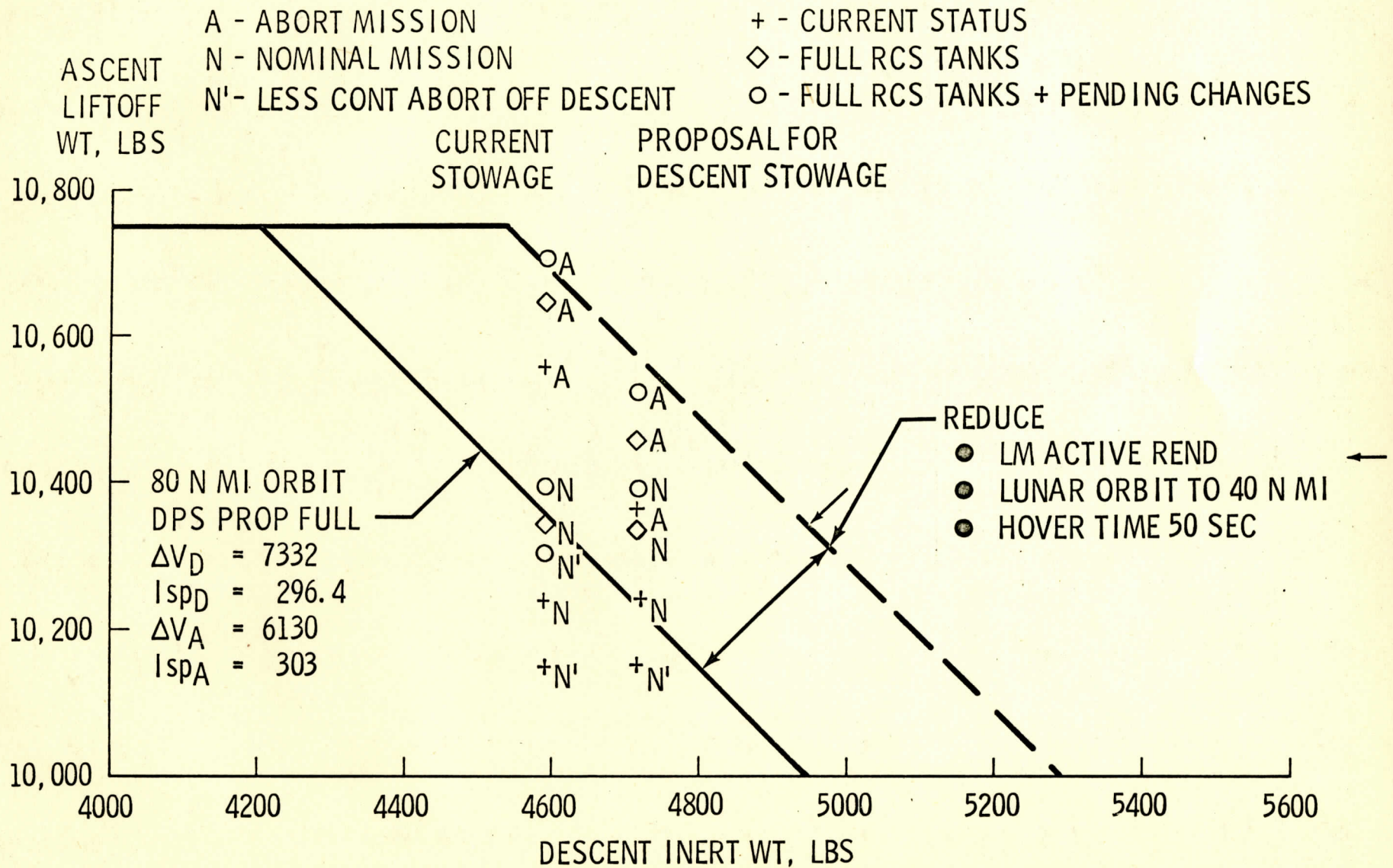
SAMPLE RETURN CONTAINERS	+ 26.8
LUNAR SAMPLES	+ 41.0
CAMERA EQUIPMENT	+ 9.5
SRC CONTENTS	+ 13.2
	<hr/> 90.5*

* 76 LB ASCENT STAGE PENALTY FOR ABORT MISSION

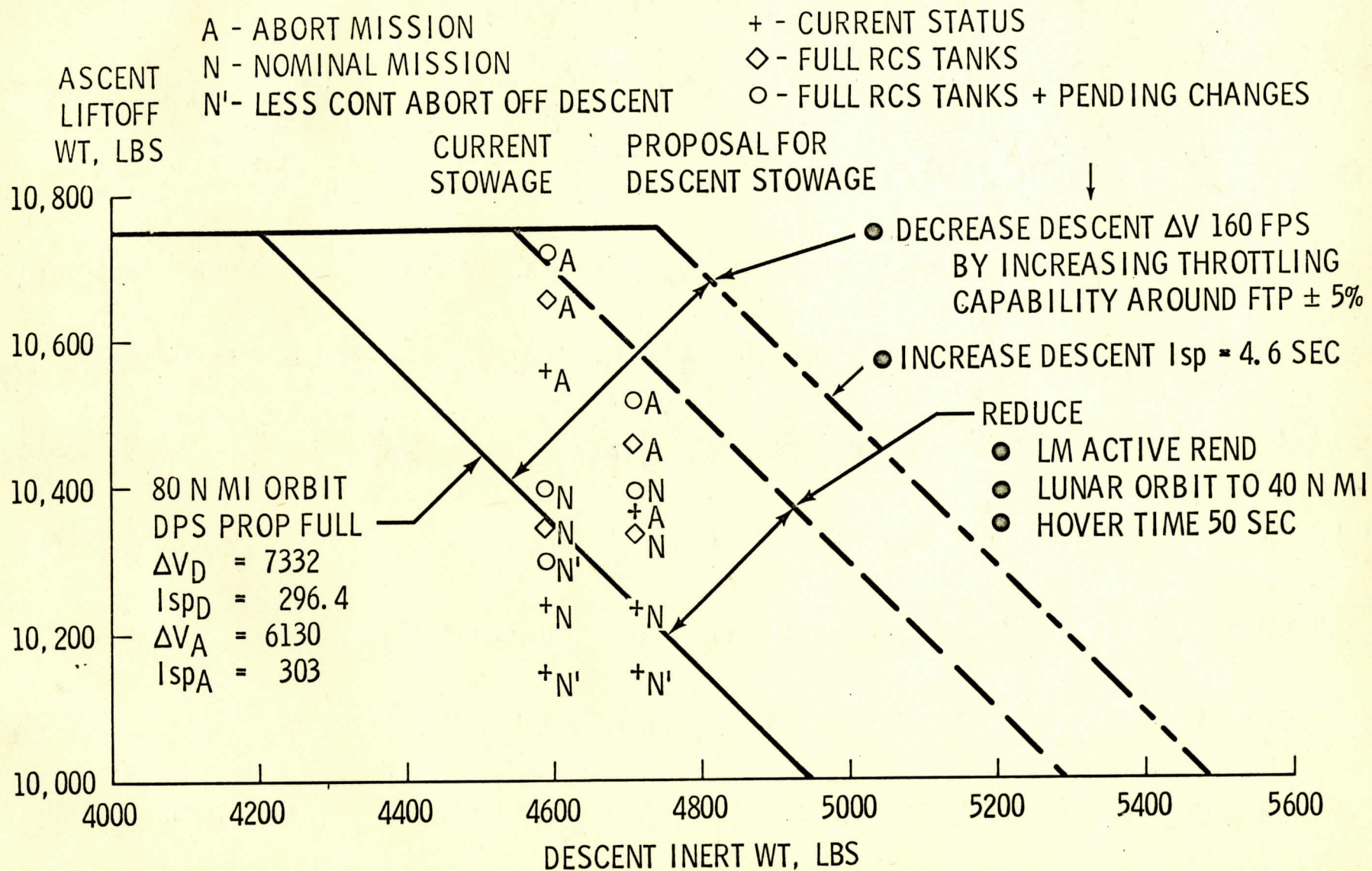
DESCENT STAGE STOWAGE MODULE

- CREW SAFETY IN OPERATIONS AT VEHICLE INTERFACES
- 'BALANCE' NOMINAL AND ABORT STOWAGE LOADS
- ENHANCE OPERATIONAL EFFICIENCY ON THE LUNAR
SURFACE

DESCENT INERT VS ASCENT LIFTOFF WEIGHT

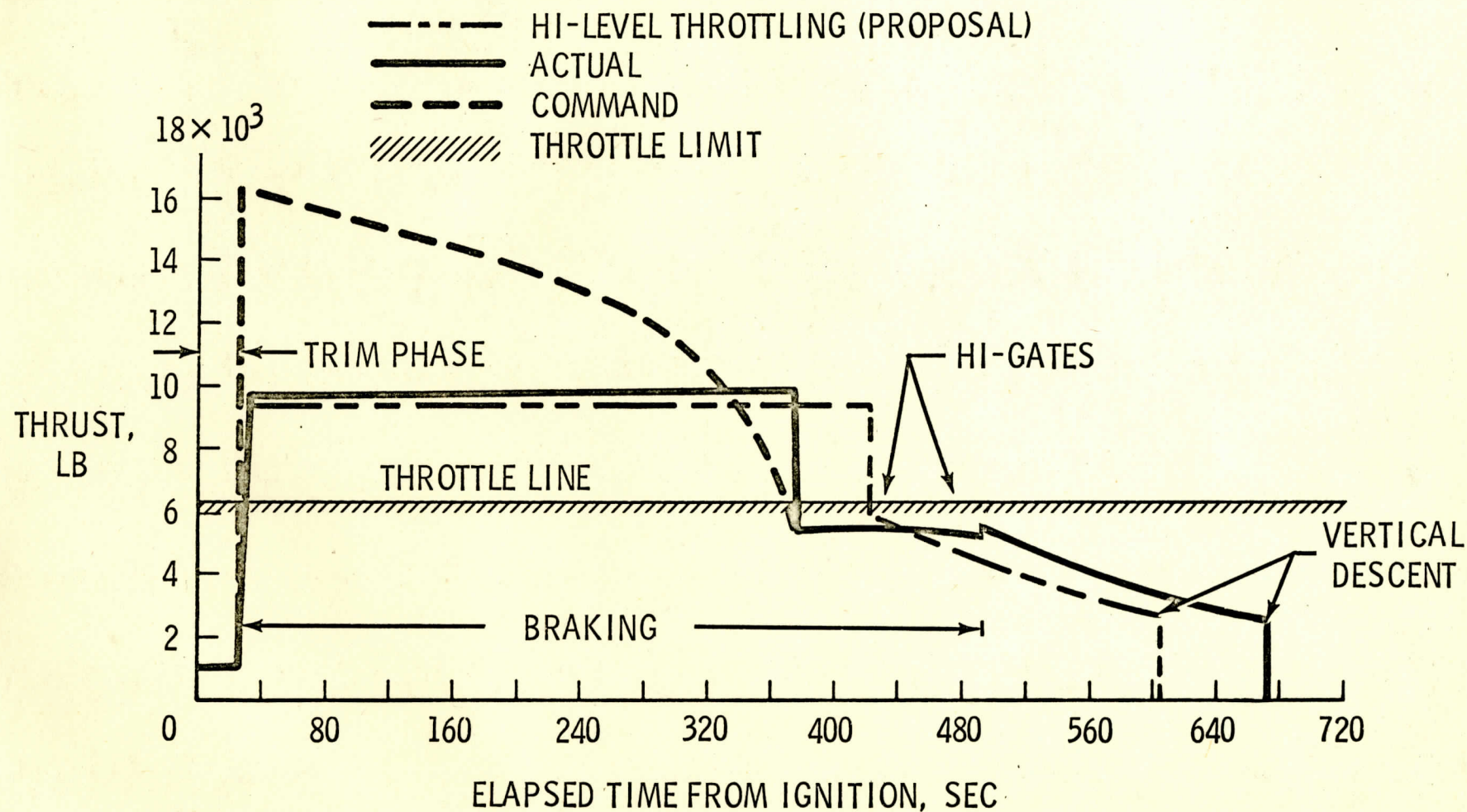


DESCENT INERT VS ASCENT LIFTOFF WEIGHT



LM SHOPPING LIST

	<u>DECREASE INERT WT</u>
ELIMINATE EXCESS WIRE LOOPS AND PIG TAILS	- 50
REDUCE STAY TIME TO 22 1/2 HOURS (ONE BATTERY)	- 134
REDUCE PLSS BATTERIES AND LiOH CANISTERS	- 20
REDUCE H ₂ O AND O ₂ REQUIREMENTS (22 1/2 HOURS)	- 60
LM ΔV REDUCTION (160 FPS) ASSOCIATED WITH MODIFICATIONS OF DESCENT ENGINE THROTTLING (±5 PERCENT FTP)	- 320

TIME HISTORIES OF POWERED DESCENT
THRUST

DESCENT ENGINE THROTTLING CHANGE IMPACT

- CURRENTLY ENGINE CONSTRAINED SUCH THAT NO OPERATIONAL CAPABILITY EXISTS IN 60 PERCENT TO FTP REGION
- PROGRAM TO INVESTIGATE THROTTLE ABOUT FTP ± 5 PERCENT IS UNDERWAY
- Δ QUAL PROGRAM
 - ENGINE
 - SOFTWARE