

AD/A-004 622

A/A 47U-3 TCW TARGET REELING MACHINE
LAUNCHER SYSTEM. (REVISED)

Marquardt Company
Van Nuys, California

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INTRODUCTION

The A/A47U-3 Reel Launcher System is designed to provide target towing capability for both subsonic and supersonic military aircraft when based ashore or afloat. It is currently applicable to the F-4 and F-101 aircraft.

The reel launcher installation is a single point position on existing centerline store station.

Targets weighing up to 225 pounds may be air launched and recovered up to 400 KEAS and towed at supersonic air speeds. Larger runway drag-off targets can also be accommodated.

The reel launcher system is under the full control of the operator.

Careful design has provided a system requiring minimum maintenance at user level with high reliability.

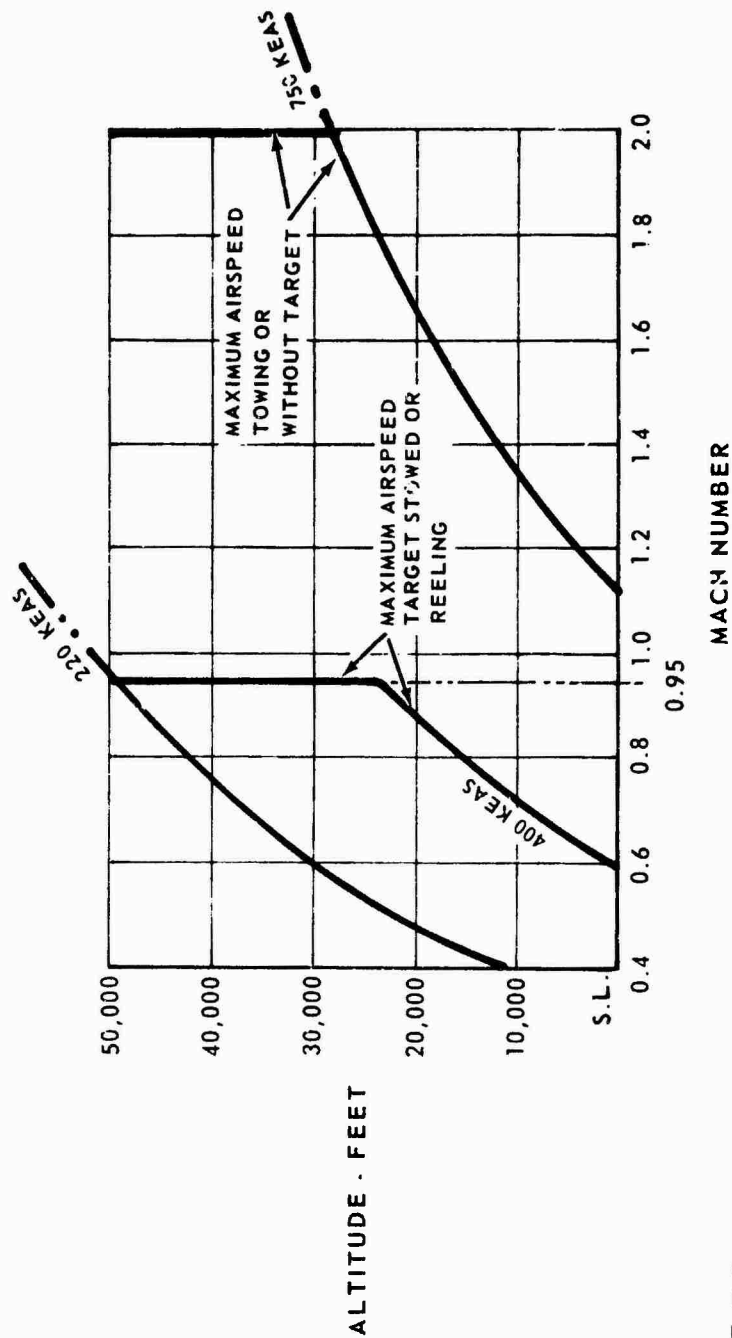
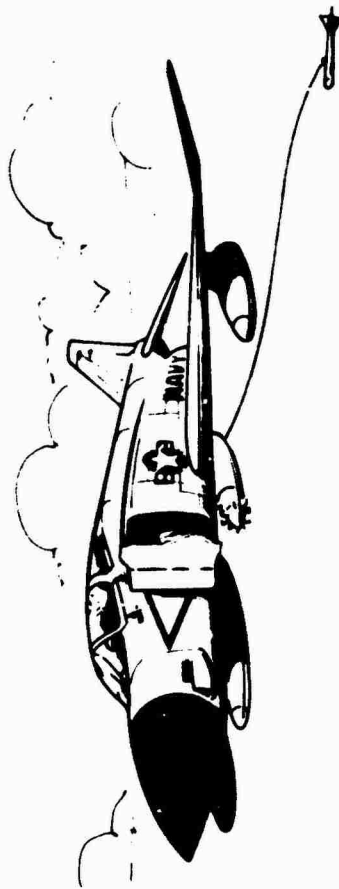


FEATURES

- SUPERSONIC TOWING CAPABILITY
- CONTROLLED TOWLINE ACCELERATION AND DECELERATION RATES
- TARGET TOWLINE LOADS TO 6,000 POUNDS
- OPERATING ALTITUDE-SEA LEVEL TO 50,000 FEET
- REELING RATES-5,000 FEET PER MINUTE MAXIMUM
- SELF POWERED
- CAPABLE OF TOWING 7 TO 12.5 INCH DIAMETER AIR LAUNCHED TARGETS & 36 FEET LONG - 15 FOOT WINGSPAN DRAG-OFF TARGETS
- TOWLINE CAPACITY TO 40,000 FEET IN LENGTH FOR TYPICAL OPERATION
- EASE OF MAINTENANCE
- LOGISTIC SUPPORT AVAILABLE

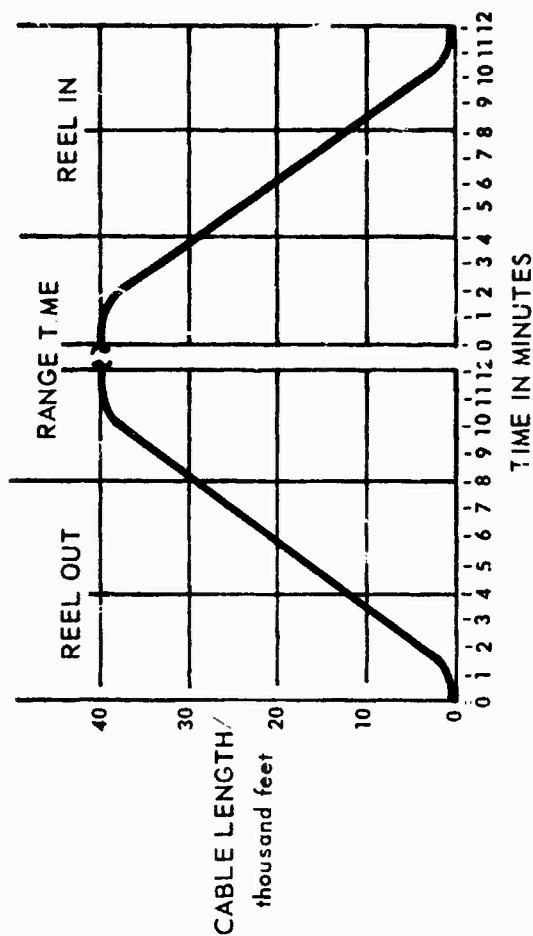
PERFORMANCE

The A/A47U-3 System provides capability for towing at aircraft speeds up to Mach 2 and at altitudes up to 50,000 feet. Flight speed during reeling must be limited to 400 KEAS, up to Mach No. 0.95, as shown below. Structural design criteria is based upon providing integrity for the stresses resulting from carrier operation.

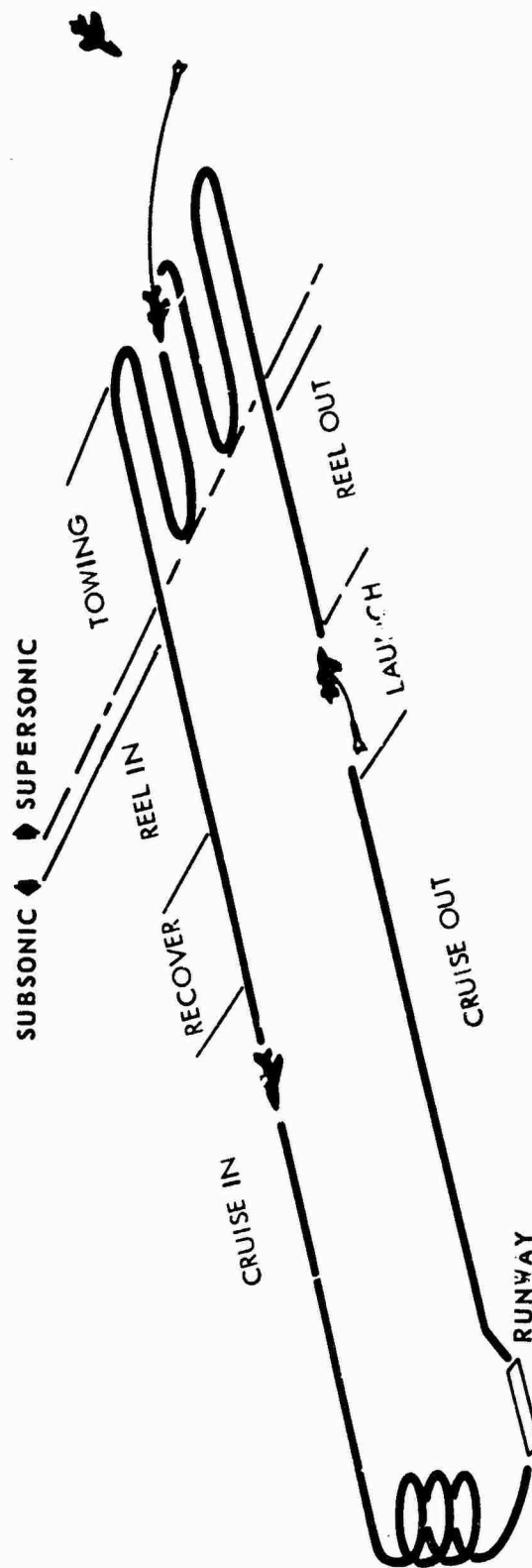


PERFORMANCE

Operations under the Typical Mission shown below can be combined to maximize "on range time". For supersonic operation, reel-out can be performed during aircraft subsonic cruise out so that the target will be in the towing position when the aircraft enters the range at supersonic speed.



TYPICAL MISSION



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DESIGN DATA

WEIGHT

WITH TRANSMISSION OIL, WITHOUT
TOWLINE/TARGET - 830 POUNDS

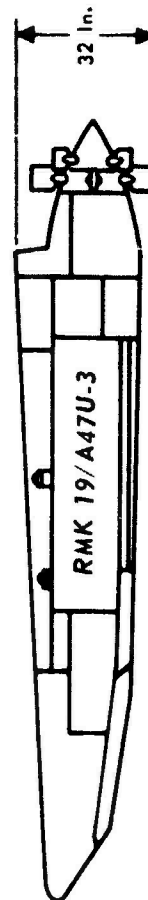
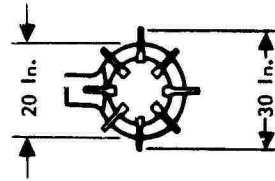
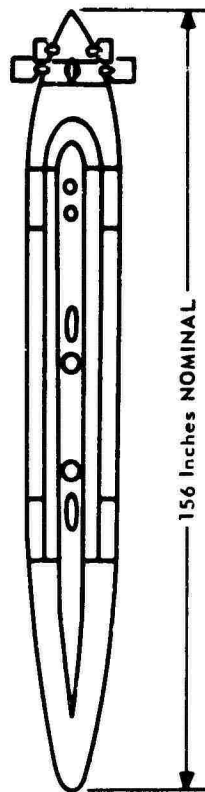
WITH TOWLINE, LESS TARGET -
1825 POUNDS

POWER UNIT

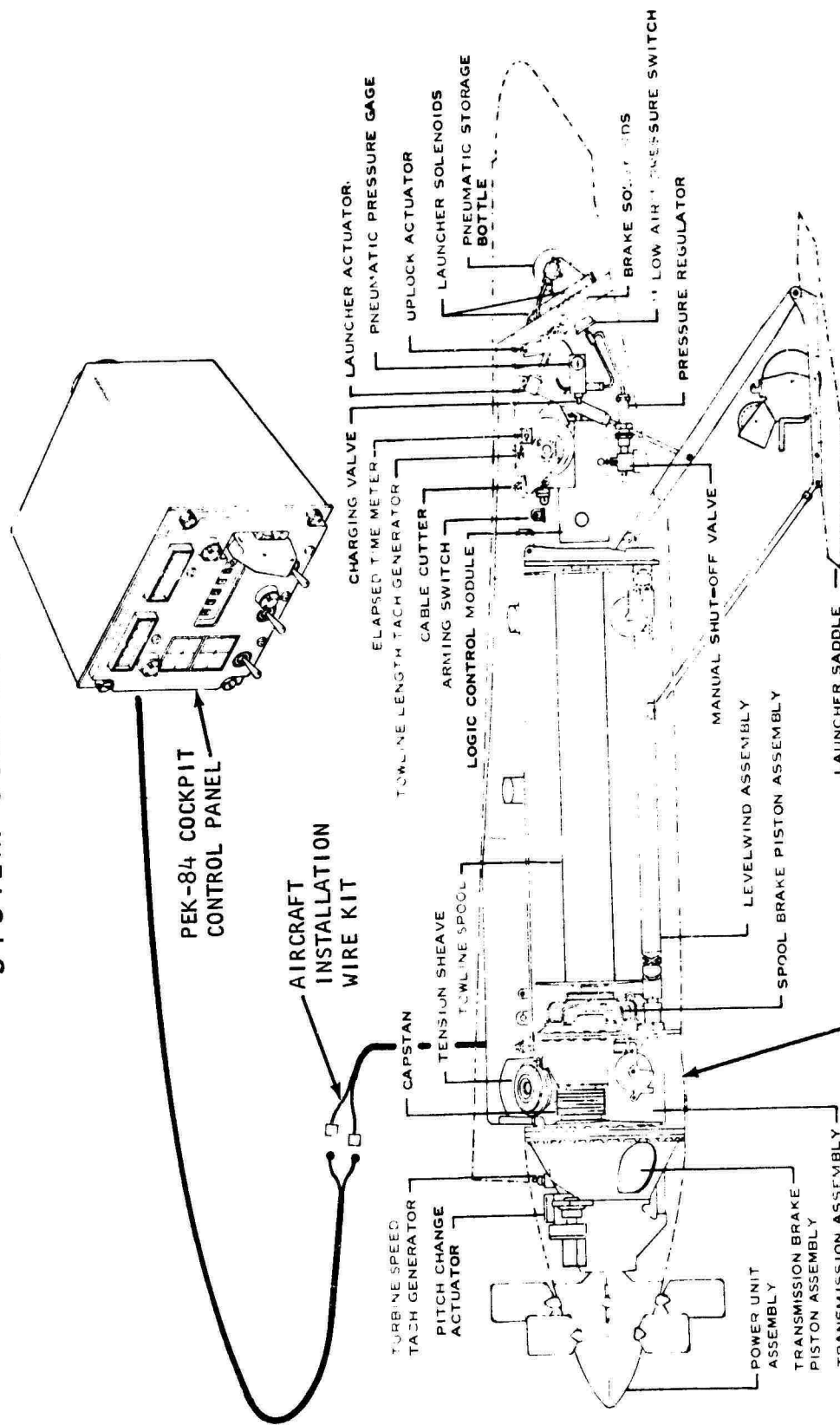
DIAMETER - 30.0 INCHES
RATING - 400 HORSEPOWER
ROTATION - BI - DIRECTIONAL
SPEED - VARIABLE TO MAX. OF 9,000 RPM
REELING RATE
MAXIMUM - 5,000 FEET PER MIN.

TOWLINE

MAX. STOWAGE VOLUME - 4750 CUBIC INCHES
TYPICAL STOWED LENGTH
OF STEPPED TOWLINE - 40,000 FEET
DIAMETER - 0.054 to 0.212



A/A 47U-3 TOW TARGET REELING MACHINE-LAUNCHER SYSTEM COMPONENTS



RMK-10 REELING MACHINE-LAUNCHER

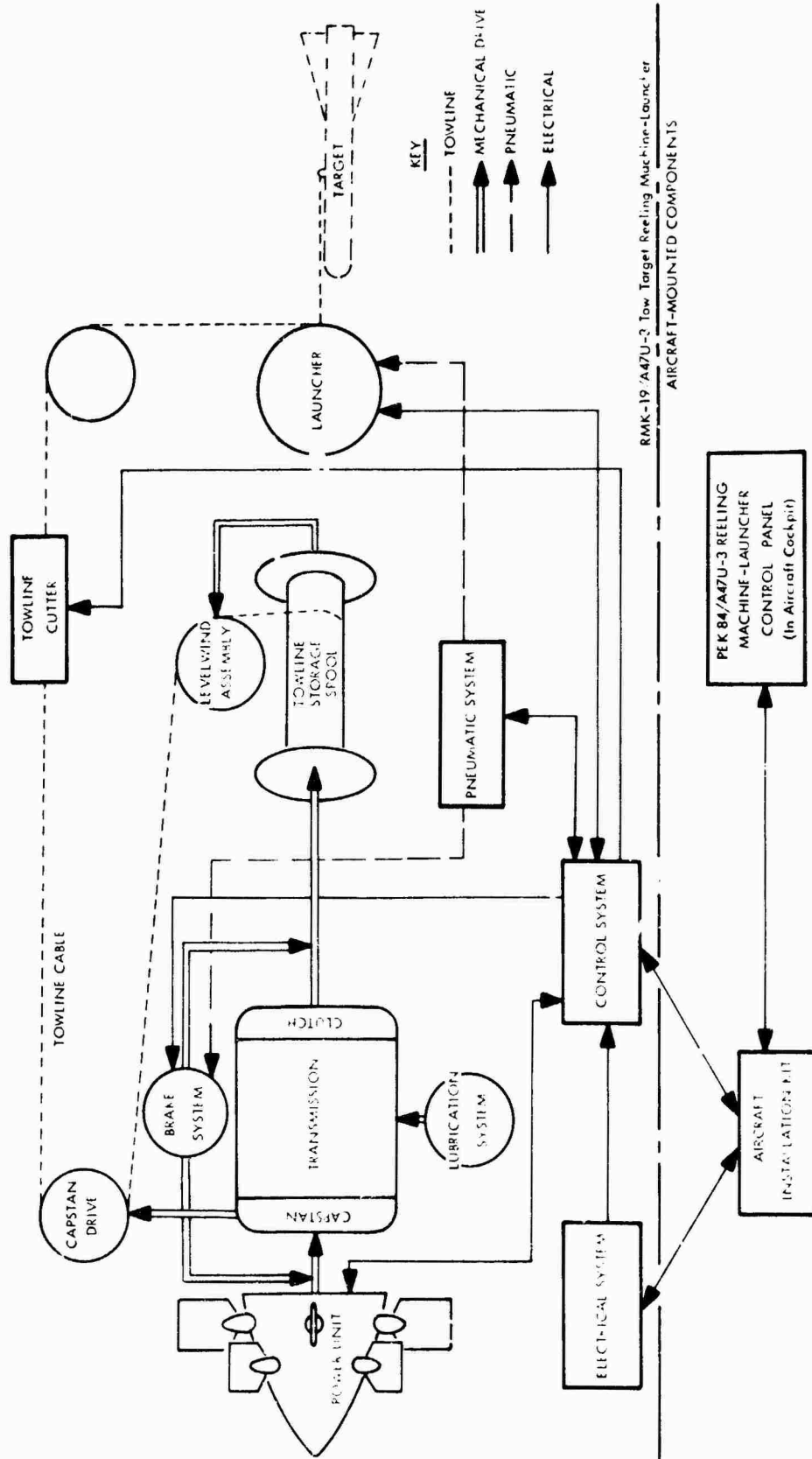
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A/A 47U-3 TOW TARGET REELING MACHINE LAUNCHER SYSTEM FUNCTIONAL FLOW BLOCK DIAGRAM



DESIGN FEATURES

POWER UNIT

The air driven power unit provides the mechanical power for the capstans, transmission, levelwind, and spool mechanism. During "reel-out", the blades provide a braking action against the drag force of the target and towline to control the speed. "Reel-In" and "Reel-Out" rates are controlled by changing the pitch of the blades.

TRANSMISSION

The transmission contains the power gear train, capstans, clutches, and speed sensors used in the reeling operations. The capstan receives the towline loads and reduces these loads to allow low tension towline storage. A system of clutches adjusts spool rotational speed to accommodate constant storing rates with varying wrap diameters.

SPOOL AND LEVELWIND MECHANISM

The spool and levelwind mechanism provides uniform towline buildup. The spool is easily removed for installation of new towline.

PNEUMATIC SYSTEM

The pneumatic system provides the necessary power to extend and retract the launcher and to apply the brakes to the reel-launcher. A storage bottle contains compressed nitrogen at 3,000 psi which is reduced to 300 psi before it is delivered to the operating solenoid valves and actuating cylinders.

LAUNCHER

The target launcher is pneumatically operated and is extended during air launch and recovery so that the target is away from the turbulent air stream of the aircraft. The launcher also acts as a shock absorber during recovery.

ELECTRICAL SYSTEM

The 28 volts d.c. electrical system controls launch, reeling, recovery, and emergency functions.

The control panel, installed in the aircraft cockpit, contains the controls and indicators necessary for operation of the reel-launcher system.



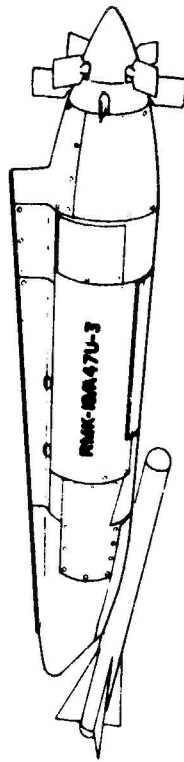
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OPERATION

AIR LAUNCHED TARGET

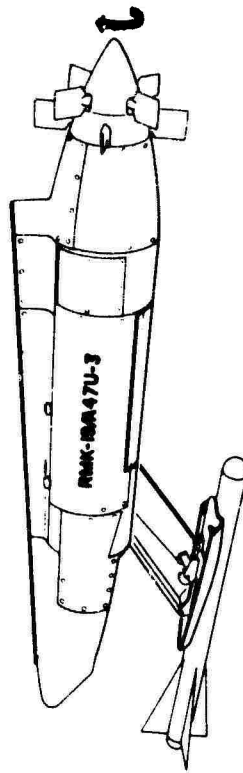
STOWED

The target is stowed and latched by the swivel locks to the reel-launcher. The power unit is "feathered", and brakes are locked, and all systems are stabilized.



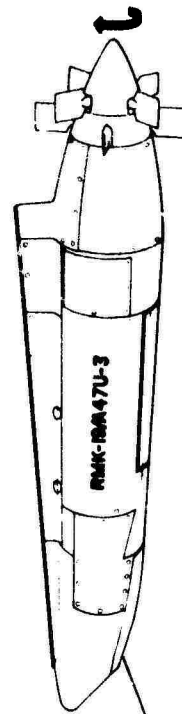
LAUNCH

The launcher is extended pneumatically, placing the target out of the turbulent flow area. The target is released from the latched position and deployed under operator control. The launcher is retracted following target deployment.



REEL OUT

The operator changes the power unit blade angle to cause reel-out rotation. Aerodynamic drag pulls the target from the RMK-19. The power unit, acting as a turbine, controls the rate of reel-out, allowing the speed to increase. The acceleration is automatically limited. Speed continues to increase until the target is being deployed at 3,500 to 4,500 fpm, depending on aircraft speed and altitude. "Reel-Out" will continue at this speed, terminating with operator controlled deceleration at the desired towline length.



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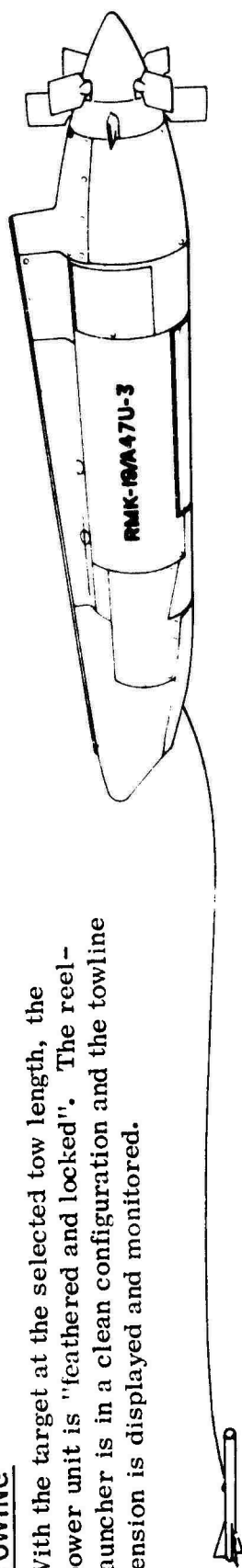
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OPERATION

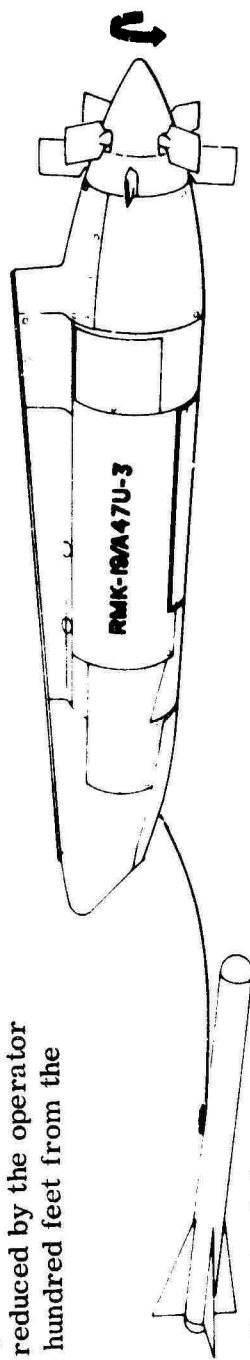
TOWING

With the target at the selected tow length, the power unit is "feathered and locked". The reel-launcher is in a clean configuration and the towline tension is displayed and monitored.



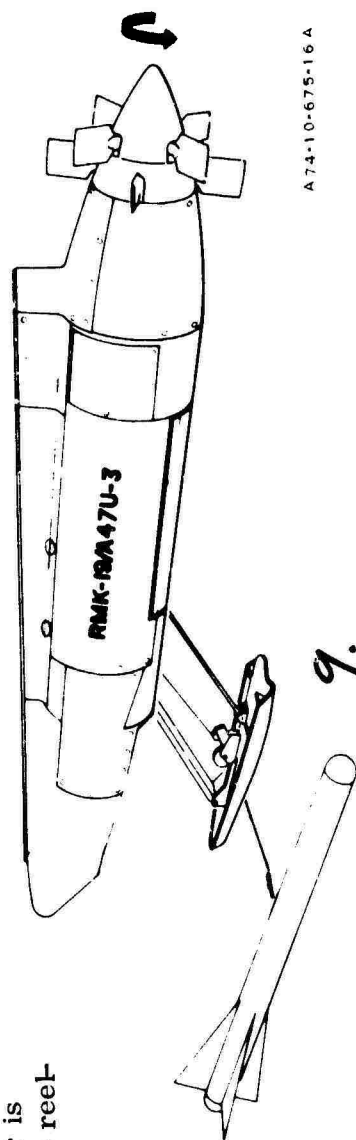
REEL IN

"Reel-In" is accomplished by changing the pitch of the blades to the reel-in configuration. The unit accelerates to a speed compatible with the target drag. "Reel-In" speed is reduced by the operator when the target is several hundred feet from the aircraft.



RECOVERY

The launcher is pneumatically extended upon command and the target is slowly retrieved by the operator under manual control. After the target reaches the launcher, the launcher is retracted and the target is secured. The reel-launcher is in the stowed configuration.

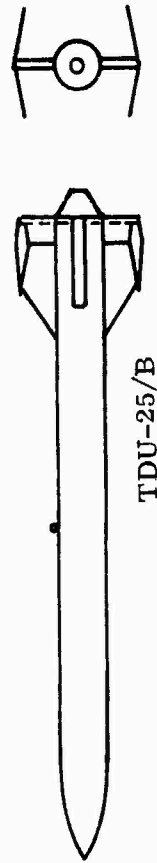
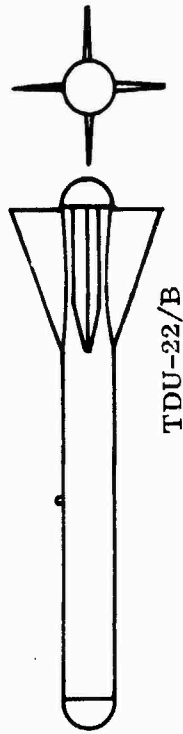


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TYPICAL AIR LAUNCH TARGETS



TYPICAL AIR LAUNCH TARGET VARIATIONS

<u>TYPE</u>	<u>LENGTH</u>	<u>DIAMETER</u>	<u>FINSPAN</u>	<u>WEIGHT</u>
TDU-22/B	76.0 in.	7.16 in.	21.73 in.	35. lbs.
TDU-22A/B	76.0 in.	7.16 in.	21.73 in.	55 lbs.
TDU-25/B	120.9 in.	9.0 in.	24.5 in.	98. lbs.

OPERATION

LARGE DRAG-OFF TARGETS

Large targets such as the TDU-29/B cannot be air-launched because of their size. Rather they are towed off the runway by the tractor aircraft.

The towline from the RMK-19 is typically extended approximately 200 feet behind the aircraft and attached to the target prior to take-off. After the target is airborne, the towline is reeled out to a predetermined length for target presentation.

Recovery is accomplished in one of three ways:

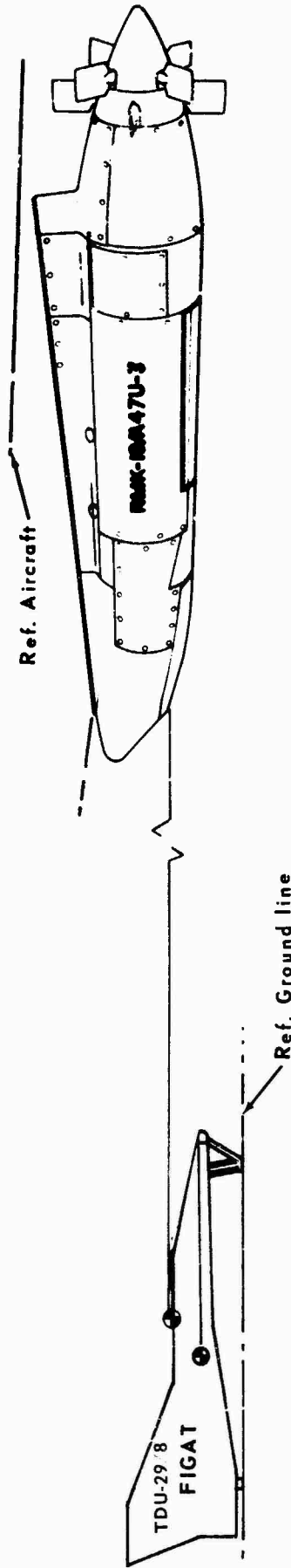
- (1) Landing the target on the runway and cutting the towline at the tow reel when the target contacts the runway. Upon severance of the towline, the tractor aircraft waves off and the target is free to skid to an unguided stop.
- (2) Landing the target simultaneously with the tractor aircraft.
- (3) Parachute recovery.

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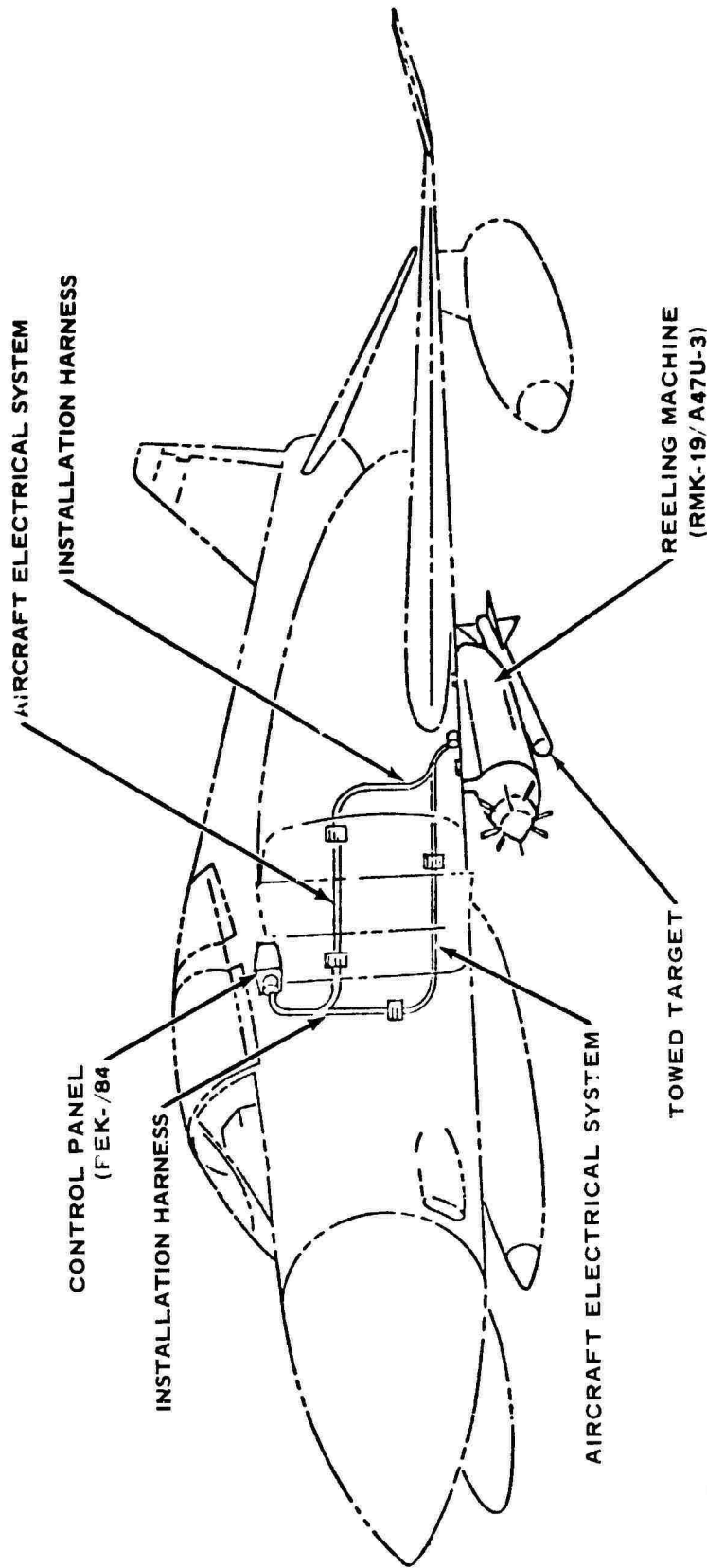
TYPICAL DRAG-OFF TARGETS



TYPICAL DRAG-OFF TARGETS - DIMENSIONAL CHARACTERISTICS

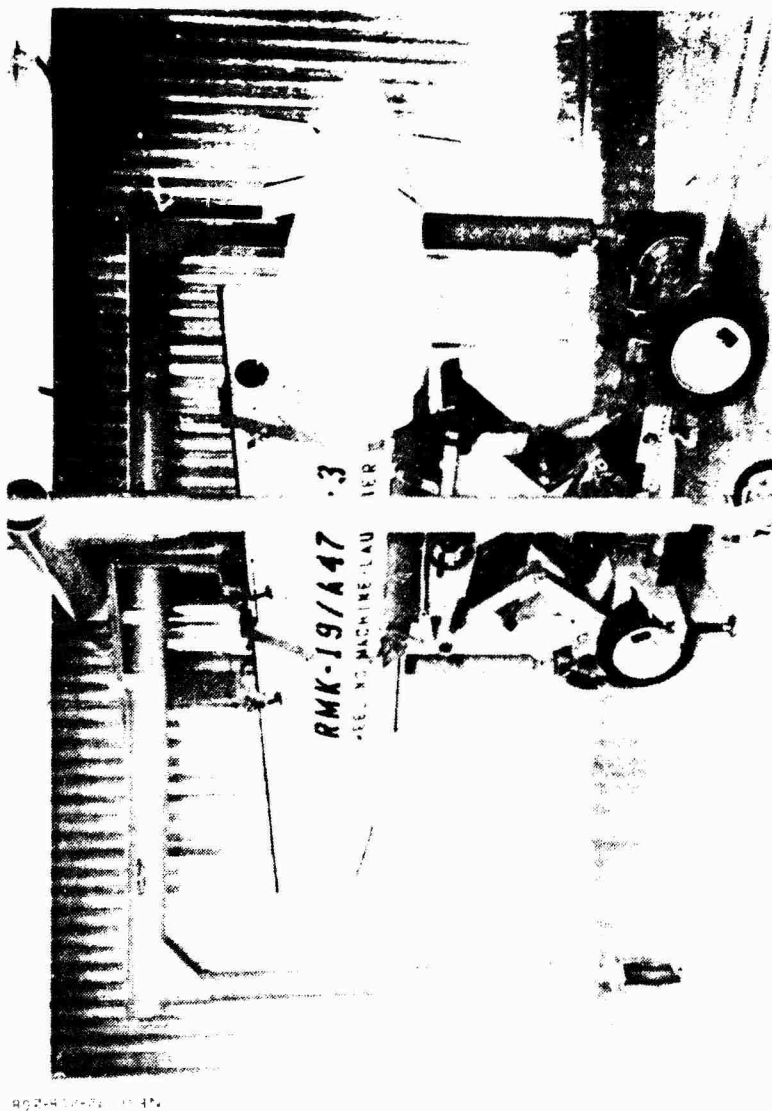
<u>TYPE</u>	<u>LENGTH</u>	<u>DIAMETER</u>	<u>WINGSPAN</u>	<u>FTNSPAN</u>	<u>WEIGHT</u>
TDU-29/B	30.0 ft.	-	8.0 ft.	-	500 lbs.
LOFAT	10.5 ft.	30.0 in.	-	4.0 ft.	300 lbs.
VASTT	17.5 ft.	27.0 in.	-	8.0 ft.	475 lbs.
MINI MIG II	36.0 ft.	24.0 in.	15.25 ft.	-	650 lbs.

INSTALLATION



The A/A47U-3 Tow Target Reeling Machine-Launcher System is readily adaptable for use. The controls necessary for utilization of the launcher systems are contained on the control panel installed in the aircraft cockpit and interconnected to the reel-launcher thru aircraft wiring. The reel-launcher mounts on a standard Aero 27A centerline rack with a 30-inch suspension. Although currently applicable to the F4 and F101, it is adaptable to other aircraft.

GROUND SUPPORT



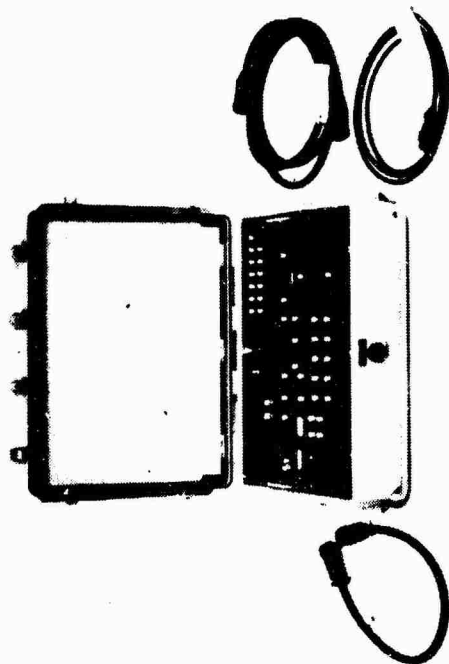
A/A47U-3 HANDLING EQUIPMENT

The A/A47U-3 uses the ADU-100/E Weapon Skid Lift Loading Adapter installed on an Aero 21A Skid. This provides launcher mobility and a means of hoisting, rotating for side loading, tilting for alignment, and lowering the reel launcher for removal or installation on an aircraft or maintenance stand. Other peculiar handling equipment available includes: Maintenance Stand, Power Unit Blade Retractor, Spool Loader, Hook and Lug Gage Set, Lifting Fixture and Power Unit Blade Guard.

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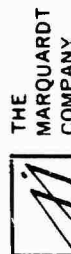


GROUND SUPPORT



MODEL A/E37T-18 ELECTRICAL TEST SET

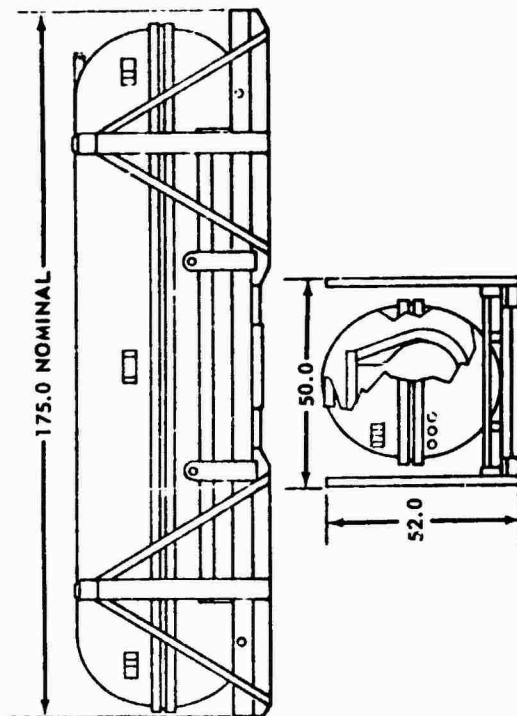
The Test Set is used to functionally test and fault isolate the A/A47U-3 System during Intermediate or Depot Level maintenance. The Test Set is capable of testing either the RMK-19 Reeling Machine-Launcher or the PEK-84. The Test Set is self-contained, with the exception of external power supply, and is hand transportable.



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The RMK-19 reusable shipping container provides maximum protection while handling, shipping and storing the unit. Top and bottom shells are held together by quick-opening latches which can be operated by personnel without the use of special tools.

The basic framework and cradle devices are constructed of steel. Legs are provided to allow stacking of not more than two containers high and positive locking features are included for increased stability. The framework has four tie-down rings, four hoisting rings, forklift (two-way entry) pockets and provisions for transport by means of two hand-trucks.



RMK-19/A47U-3 SHIPPING CONTAINER