UNITED STATES ARMY AVIATION BOARD
Fort Rucker, Alabama

PROJECT NO. AVN 1963

(6) REPORT OF TEST AND EVALUATION OF THE GENERATOR SET, FSN 6115-511-2210 (APU)

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PART I - GENERAL

A. References. See part III.

B. Authority.

1. Directive. Letter, TCMAC-ED/58371, US Army Transportation Materiel Command, 28 March 1961, subject: "Project Nr. K-61-2-23, Task Nr. K-16, APU Unit, P/N 6115-511-2210."

2. Purpose. To determine the suitability of the Generator Set, FSN 6115-511-2210, (APU) for use in servicing Army aircraft.

C. Background.

1. The generator set (APU) was developed and originally tested by the Industrial Branch, Field Service Division, Rossford Ordnance Depot, Toledo, Ohio. In May 1960, Rossford Ordnance requested the US Army Transportation Materiel Command (USATMC) to evaluate the generator set (APU). USATMC concurred in this request and posed the following requirements:

a. To determine if the subject unit installed in the M-100 1/4-ton trailer would satisfy the mobility requirements (reference 4).

b. To determine if the state-of-charge of the battery installed in the aircraft could be determined by using the ammeter which is mounted on the generator set (APU).

c. To determine if subject unit is suitable for starting all types of Army aircraft.

2. In 1961, the generator set (APU) was tested by the US Army Transportation Aircraft Test and Support Activity. Testing determined that, in order for the equipment to fulfill these requirements (listed in paragraph 1 above) satisfactorily, certain modifications would be required (reference 1 and 2). At a meeting following completion of testing, it was suggested by USATMC and Rossford Ordnance representatives that the APU be returned to Rossford Ordnance for modification. The following modifications were accomplished:

a. Installation of larger type wheels.

b. Addition of a towing arrangement.

c. Minor structural changes to the battery rack.

d. Addition of a third wheel.

The modified generator set (APU) was received for test on 13 July 1962.

D. Description of Materiel. The generator set, FSN 6115-511-2210, (APU) (figure 1) manufactured by Waukesha is a self-contained, portable, 263-ampere, 7.5-kw., 28.5-v.d.c. electric power plant which is powered by a four-cylinder gasoline engine. A belt-driven d.c. generator is installed on a rubber-wheeled mounting and provides d.c. power for aircraft-engine starting and functional checking of Army aircraft electrical systems. The engine and generator are secured to supports installed on two steel channels mounted on spring assemblies that serve as vibration dampers. A mounting provision for an aircraft battery is provided at the rear of the stand. A towing arrangement is attached to the mounting frame, and a third wheel is provided for ease of handling.

E. Test Objectives.

1. Suitability for use in starting all Army aircraft, charging batteries while installed in aircraft, and determining the state-of-charge of the installed battery.

2. Adequacy of the prescribed starting procedure.

3. Any improvements in the ground-handling characteristics of the Generator Set, FSN 6115-511-2210 (APU) over the Generator Set (APU) previously tested (reference 1).

4. Maximum speed at which the Generator Set, FSN 6115-511-2210, (APU) can be towed satisfactorily.

Figure 1 The generator set (APU) was used to charge airplane batteries.

F. Findings.

1. Scope of Test. During the test period (26 July 1962 to 26 September 1962), the generator set (APU) was utilized for attempting to start all types of Army aircraft in the inventory. The generator set (APU) was evaluated under conditions simulating as closely as possible conditions experienced in field units. Ambient temperatures ranged from 64° to 97° F. during the test period.

2. Results of Test.

a. The generator set (APU) demonstrated an improvement in the ground-handling characteristics over the model previously tested.

b. Maximum safe towing speed was determined to be ten miles per hour on improved surfaces and five miles per hour on semi-improved surfaces.

c. The generator set (APU) was found to be capable of charging all Army aircraft batteries and determining the state-of-charge of a battery; however, test results determined that the generator was not suitable for starting the UH-1 and OV-1 turbine-powered aircraft because of its insufficient power output.

G. Conclusions.

1. The generator set (APU) is not suitable for starting all types of Army aircraft.

2. Modifications made to the generator set (APU) as a result of the previous test (reference 3, part III) improved ground-handling.

3. Maximum safe towing speed was ten miles per hour on improved surfaces and five miles per hour on semi-improved surfaces.

4. The state-of-charge of a battery may be determined by using the ammeter of the generator set (APU).

H. Recommendation. It is recommended that no further consideration be given to modifying the Generator Set, FSN 6115-511-2210, (APU) since it is not suitable for use with all Army aircraft.

A. J. RANKIN
Colonel, Armor
President

PART II - TEST DATA

A. Suitability. This portion of the evaluation pertains to the suitability of the generator set (APU) in terms of actual application to Army aircraft. Two tests were conducted. In test No. 1S, data were recorded to determine the applicability of the generator to Army aircraft. In test No. 2S, data were recorded to determine if the state-of-charge may be determined by using the ammeter mounted on the APU during charging cycle.

1. Test Number 1S - Starting Army Aircraft. During the test period the generator was used satisfactorily to start all types of Army aircraft, with the exception of the turbine-powered UH-1 and OV-1 which require a maximum of approximately 750 to 900 amperes for a satisfactory start. The maximum output of the generator set (APU) is 263 amperes. During this test the suitability of the generator set (APU) for starting aircraft in ambient temperatures below 64°F. was not determined.

2. Test Number 2S - Charging Army Aircraft Batteries. The generator set (APU) was satisfactorily used to determine the state-of-charge of batteries installed in the aircraft and to charge the batteries. The prescribed starting procedure (outlined below) was used in determining the state-of-charge and charging the battery. An additional step (paragraph c) was found to be necessary.

a. Place battery switch in the aircraft in OFF position.

b. Connect power unit to aircraft and turn generator set (APU) power switch ON.

c. Note generator-mounted ammeter reading of generator set (APU).

d. Turn the aircraft battery switch ON and note the rise in generator-mounted ammeter reading. The rise indicates the battery state-of-charge.

e. Check to see that the generator set (APU) voltmeter reads between 28.5 and 29.0 volts.

f. Continue charging until the ammeter has dropped to within 5 or 10 amperes of the reading recorded before the aircraft

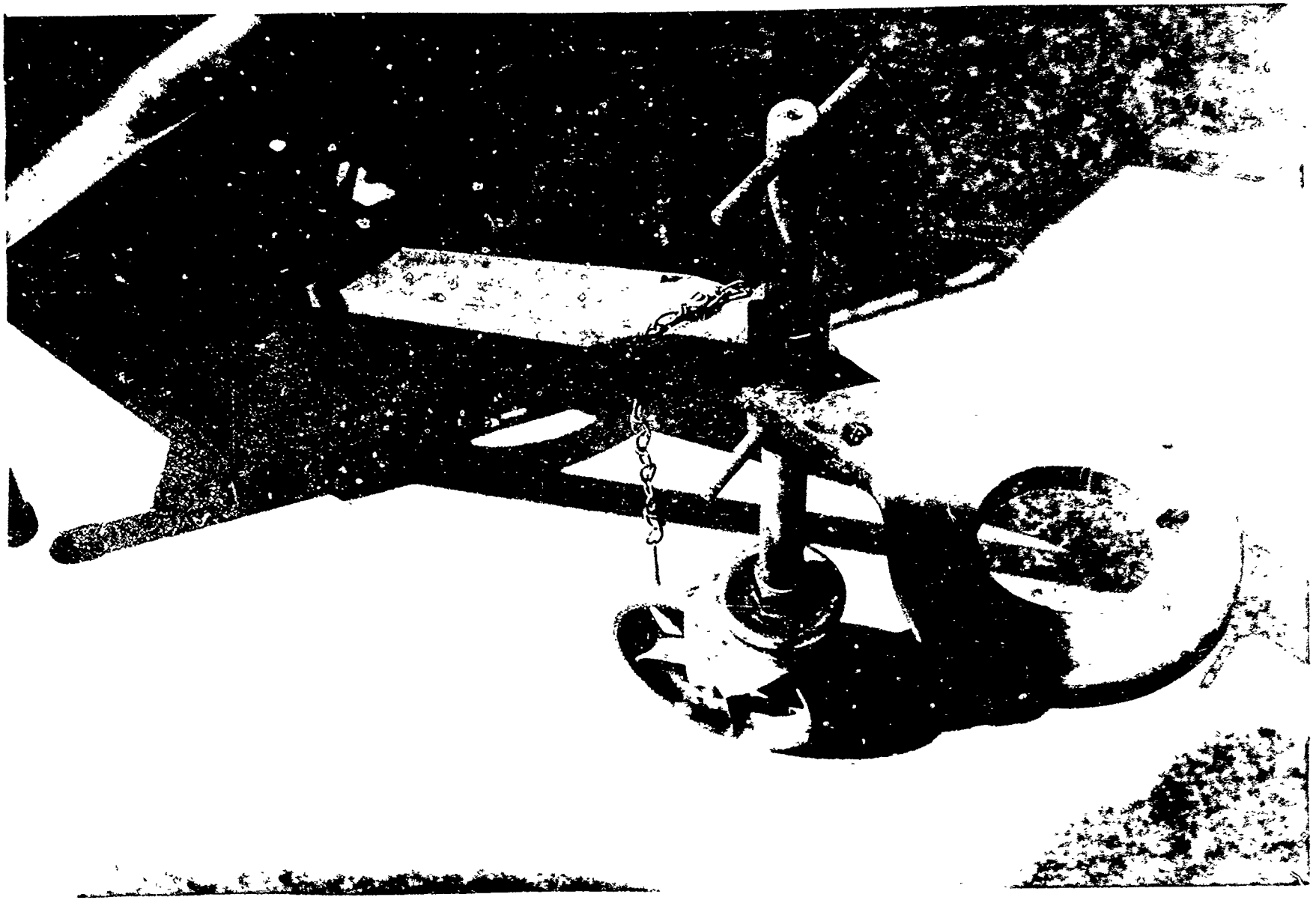

Figure 2. The added third wheel

battery switch was closed. When the current reading has dropped, the battery is charged and ready for service. During charging of battery, the battery should be checked periodically for proper venting of fumes and acid spillage.

g. Turn the aircraft battery switch OFF, the generator set (APU) power switch OFF, and disconnect the generator set (APU).

B. Modifications. This portion of the evaluation pertains to the handling characteristics of the generator set (APU) as a result of the modifications. Two tests were conducted. In test No. 1M, observations were made during actual use of the generator set (APU) to determine the ease of handling. In test No. 2M, data were collected while towing to determine the maximum safe speed and the type of terrain to which the generator set (APU) should be restricted.

1. Test Number 1M - Modifications. The modifications improved the handling characteristics of the generator set (APU). The two wheels were moved approximately six inches aft, which improved the balance and handling. The third wheel was a swivel type which facilitated turning and permitted the unit to be pushed or pulled without tilting (see figure 2).

2. Test Number 2M - Towing. It was determined during test that, with the added towing arrangement, the maximum safe towing speed was ten miles per hour on improved surfaces and five miles per hour on semi-improved surfaces. Towing could be accomplished by tug only (see figure 3). The maximum height which the towing eye could be lifted onto a pintle hook was 15 inches. A 1/4-ton truck was not a suitable towing vehicle due to the height of the pintle hook (see figure 4).

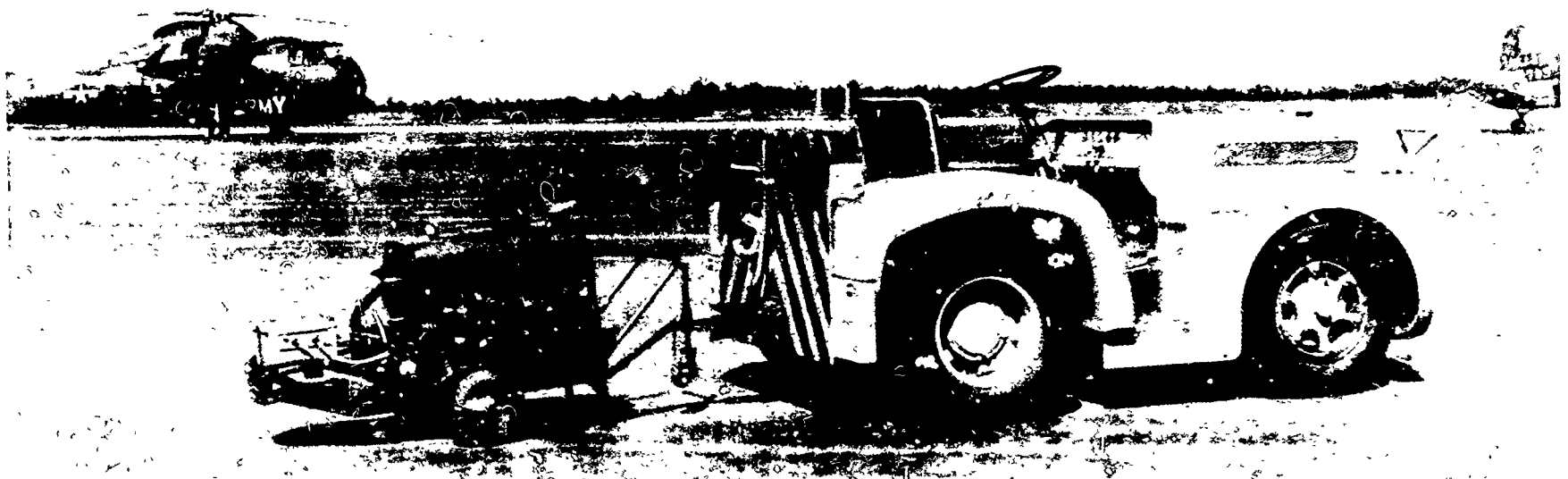

Figure 3. The genera : set (APU) could be towed satisfactorily by a tug only

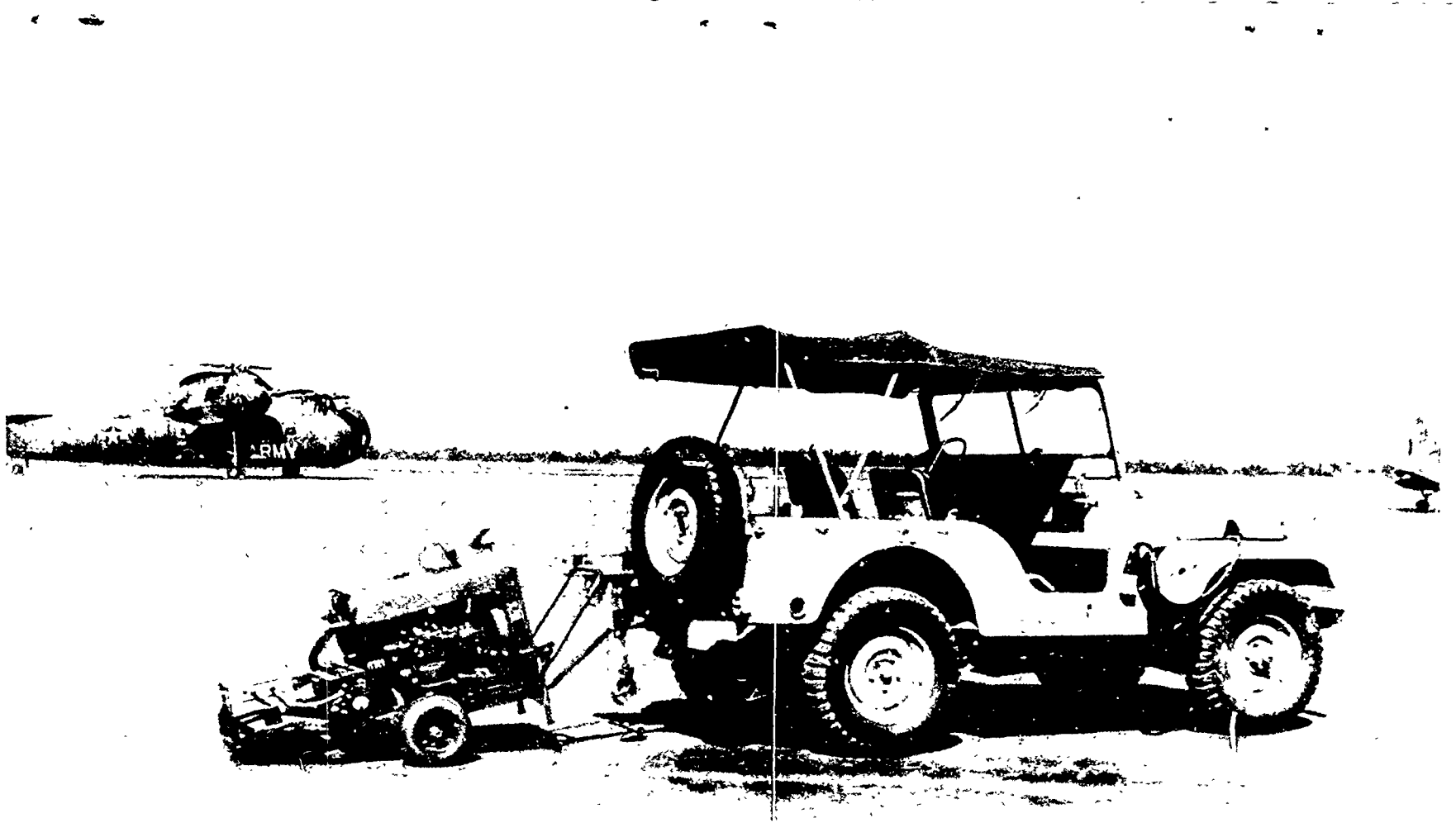

Figure 4. A jeep was not a suitable towing vehicle.

PART III

List of References

1. US Army Transportation Aircraft Test and Support Activity, Project No. K-61-2-23, Task No. K-16, APU Unit, P/N 6115-511-2210, 20 March 1961.

2. Letter, TCATA-OP, US Army Transportation Aircraft Test and Support Activity, 6 April 1961, subject: "APU P/N 6115-511-2210."

3. End-of-Test Report, "Multi-Purpose Ground Servicing Vehicle, Model 2100-5," US Army Transportation Aircraft Test and Support Activity, 29 August 1961.

4. Military Specifications, MIL-M-00809B, February 1958.