ARMORED MEDICAL RESEARCH LABORATORY

FORT KNOX, KENTUCKY

PROJECT NO. 3 - TOXIC GASES IN ARMORED VEHICLES

Supplemental Report On

Sub-Project No. 3-12 - The Carbon Monoxide Hazard from Auxiliary Generators in Tanks

Project No. 3-12

April 2, 1943

ARMORED FORCE MEDICAL RESEARCH LABORATORY
Fort Knox, Kentucky

Project No. 3-12
File No. 723.13-1 GNOML

April 2, 1943

Supplemental Report On

CARBON MONOXIDE HAZARD FROM AUXILIARY GENERATORS IN TANKS

1. PROJECT: No. 3-12, Determination of the Carbon Monoxide Hazard from Auxiliary Generators in Tanks.

a. Authority - Letter Commanding General, Headquarters Armored Force, Fort Knox, Kentucky, 400.112/6 GNOHD, dated September 24, 1942.

b. Purpose - To determine the magnitude of the carbon monoxide hazard resulting from operation of auxiliary generators in tanks when the tank motor is not running.

2. DISCUSSION:

a. Methods. This report is a supplement to the report on M4 medium tanks, dated December 20, 1942, and covers the findings on three additional tanks: the M4A4, the M5A1 and the M7.

b. Carbon monoxide concentrations were determined at three points inside the tank during operation of the auxiliary generator: at an opening in the bulkhead and at the breathing zones of the loader and driver. In each case the tank was located in an open yard and oriented so as to provide a tail wind. The tank was buttoned up and the engine not running.

c. All tests were made without modifications in the location of the exhaust line from the auxiliary generator.

3. CONCLUSIONS:

a. Diffusion of carbon monoxide throughout the fighting compartment occurs rapidly so that the concentration in the bow is only slightly lower than in the turret.

b. M4A4.

(1) Operation of the auxiliary generator in the M4A4 tank when the tank engine is not running produces hazardous concentrations of carbon monoxide in the fighting compartment. (Fig. 1)

c. M5A1 and M7.

(1) The carbon monoxide concentrations found in the fighting compartments of these tanks, in the present tests, could be tolerated without danger for from one-half to one hour. The data indicate that a potential hazard exists. (Figs. 2 and 3)

4. RECOMMENDATIONS:

a. Extend the exhaust pipe from the auxiliary generator in the M4A4, M5A1 and M7 tanks so as to discharge beyond the rear wall of the engine compartment, in accordance with the recommendations of the report dated December 20, 1942.

b. Construction and maintenance of the exhaust line should be adequate to prevent direct leakage of exhaust gases into the fighting compartment.

c. Whenever possible, the hatches should be open during operation of the auxiliary generator with the tank motor not running.

Submitted by:

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WILLARD MACHLE
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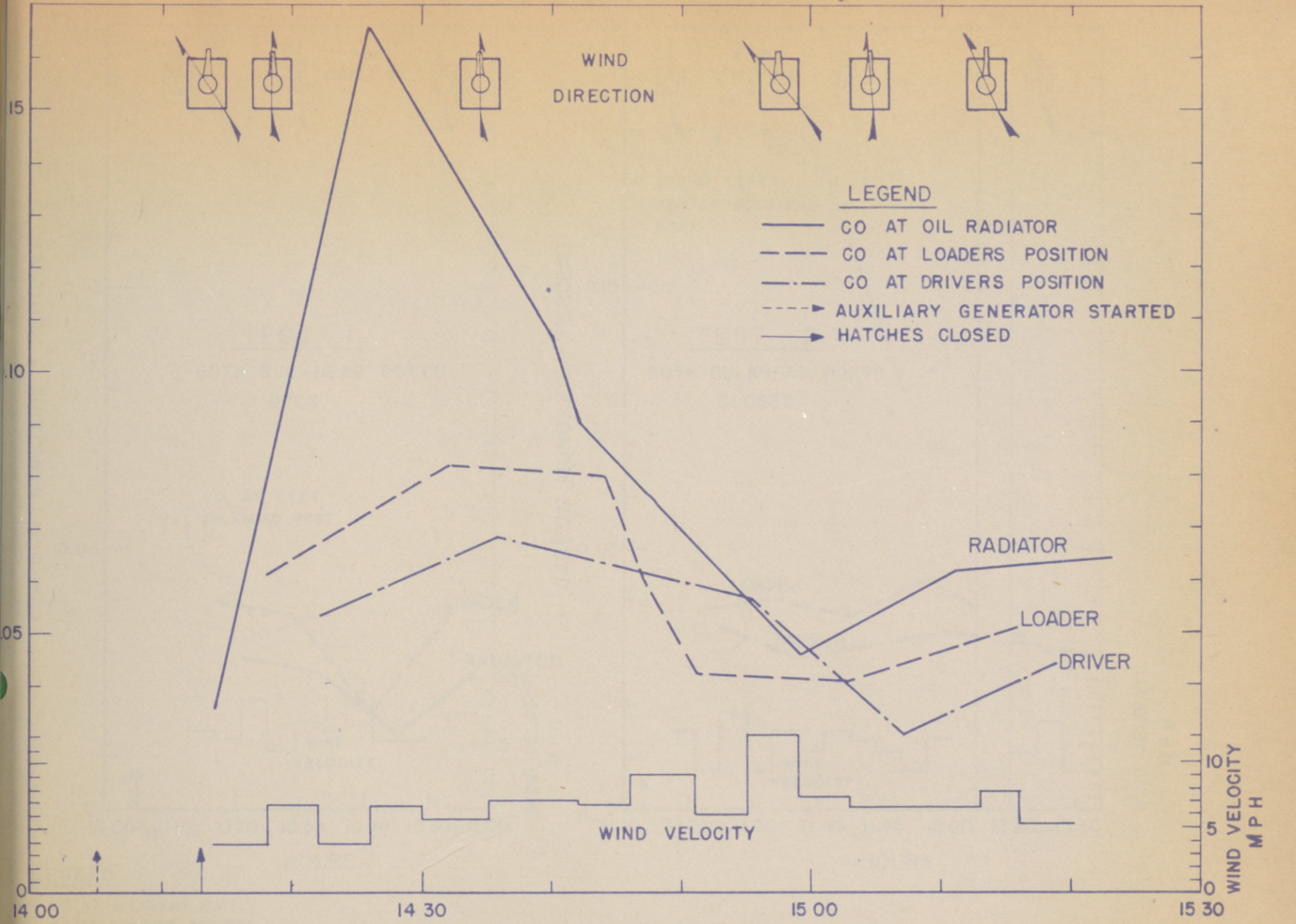
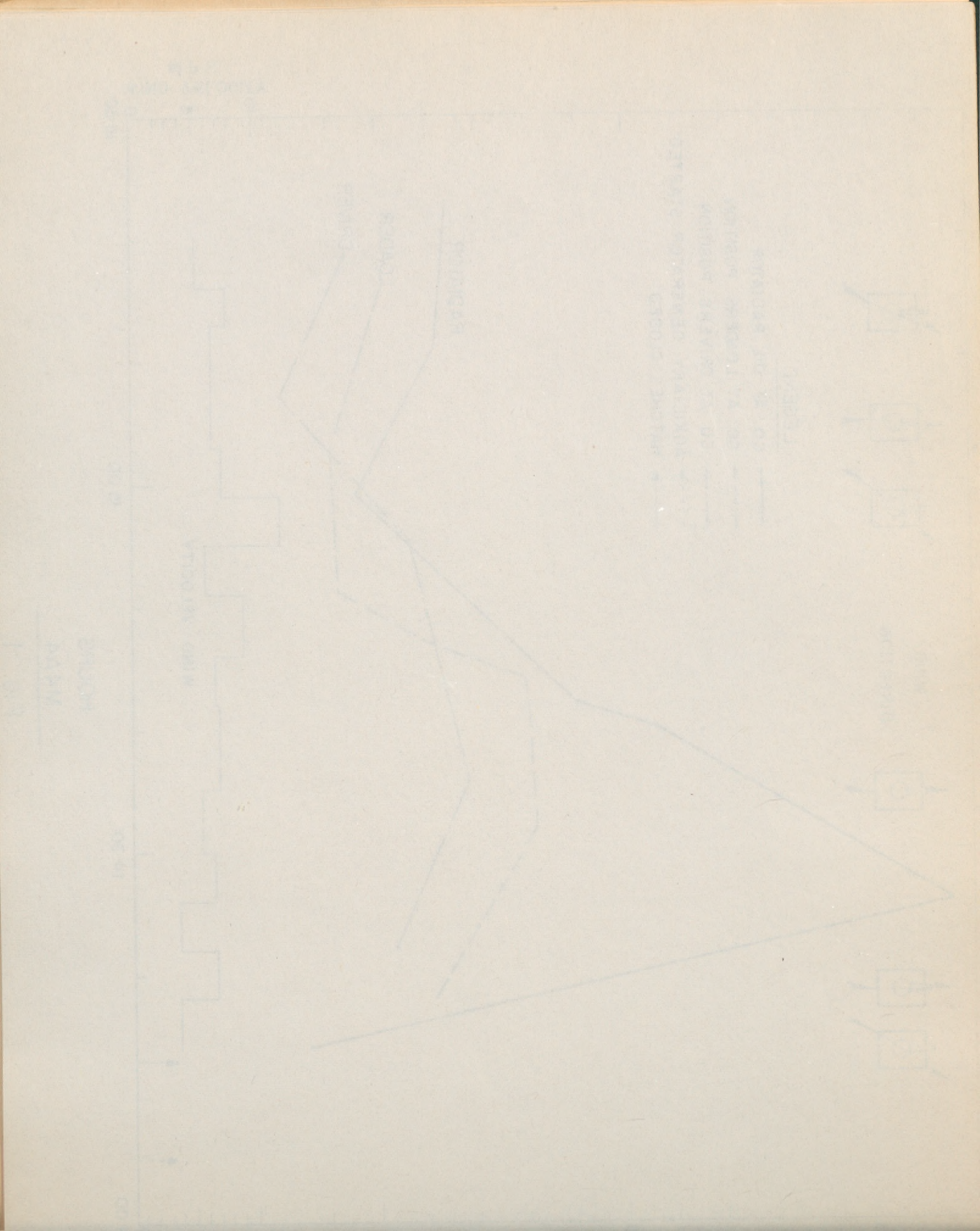
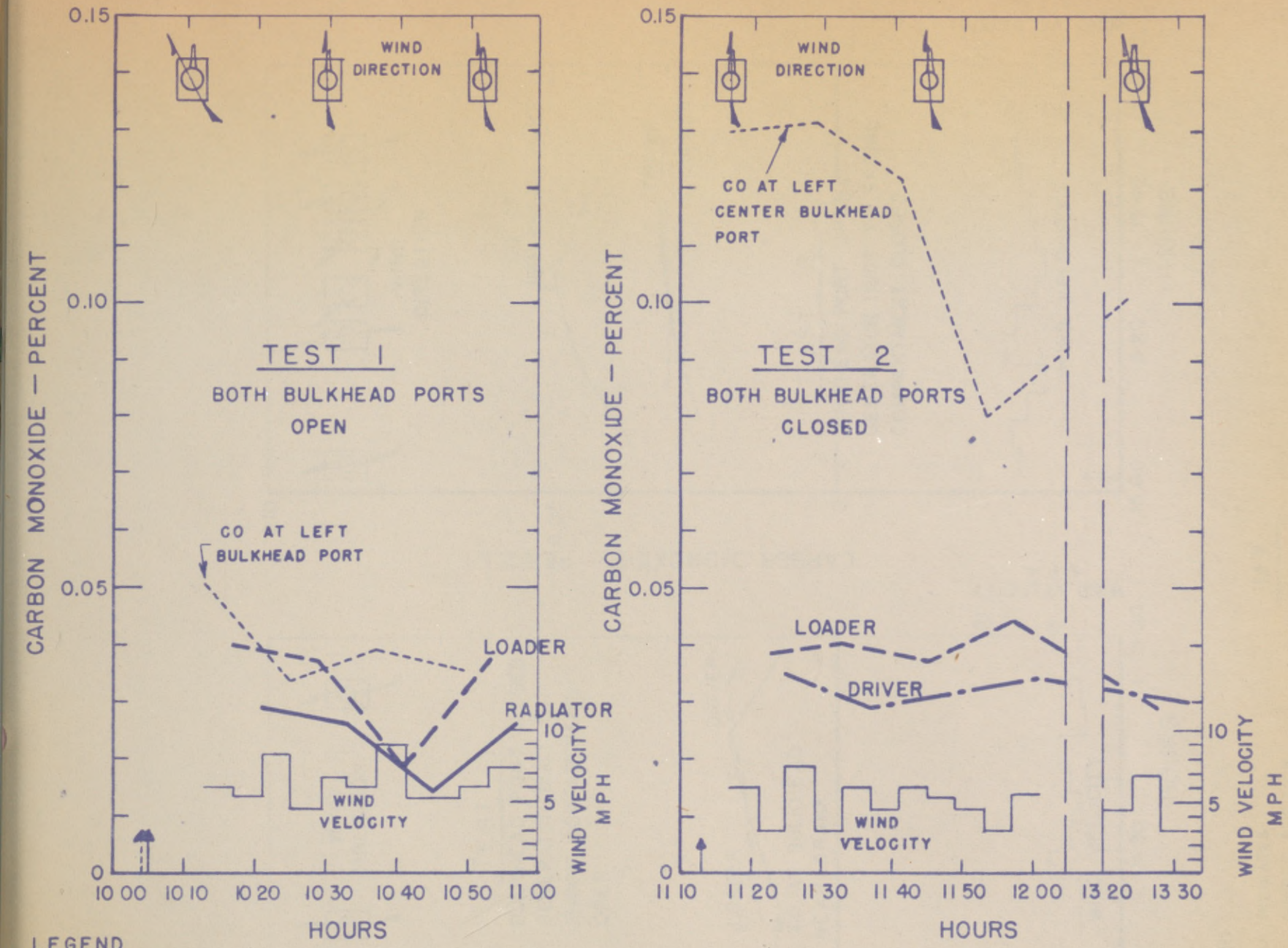
3 Incls.
#1 - Fig. 1
#2 - Fig. 2
#3 - Fig. 3


WIND
DIRECTION
LEGEND
CO AT OIL RADIATOR
CO AT LOADERS POSITION
CO AT DRIVERS POSITION
AUXILIARY GENERATOR STARTED
HATCHES CLOSED
RADIATOR
LOADER
DRIVER
WIND VELOCITY
15
.10
.05
0
14 00
14 30
15 00
15 30
10
5
0
WIND VELOCITY
MPH
HOURS

M4A4

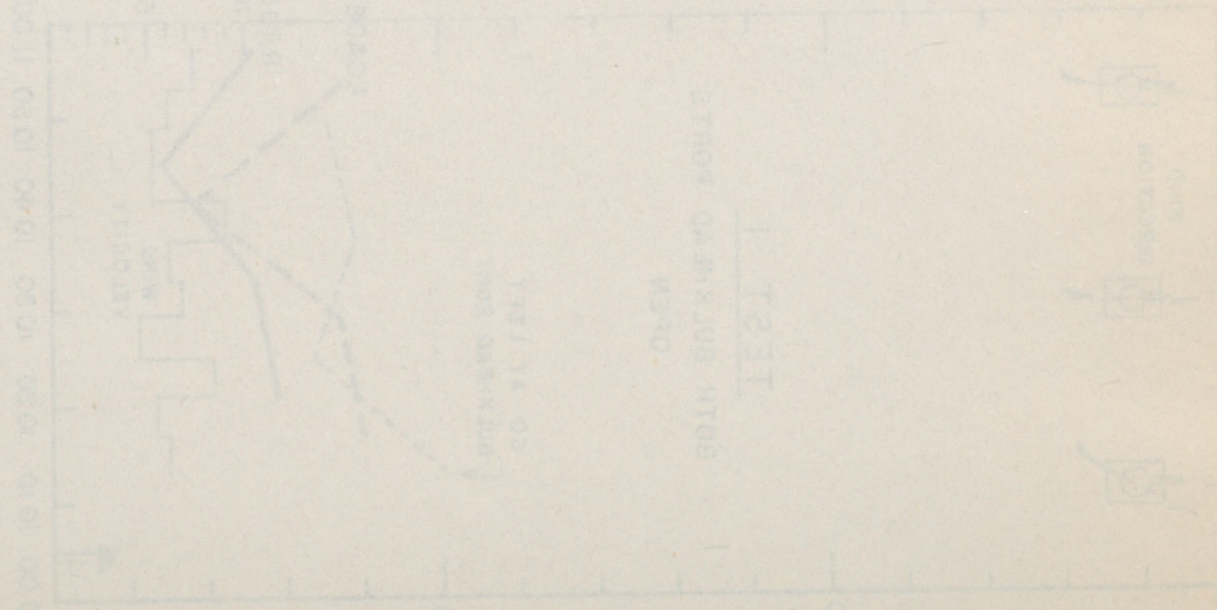
FIG. 1

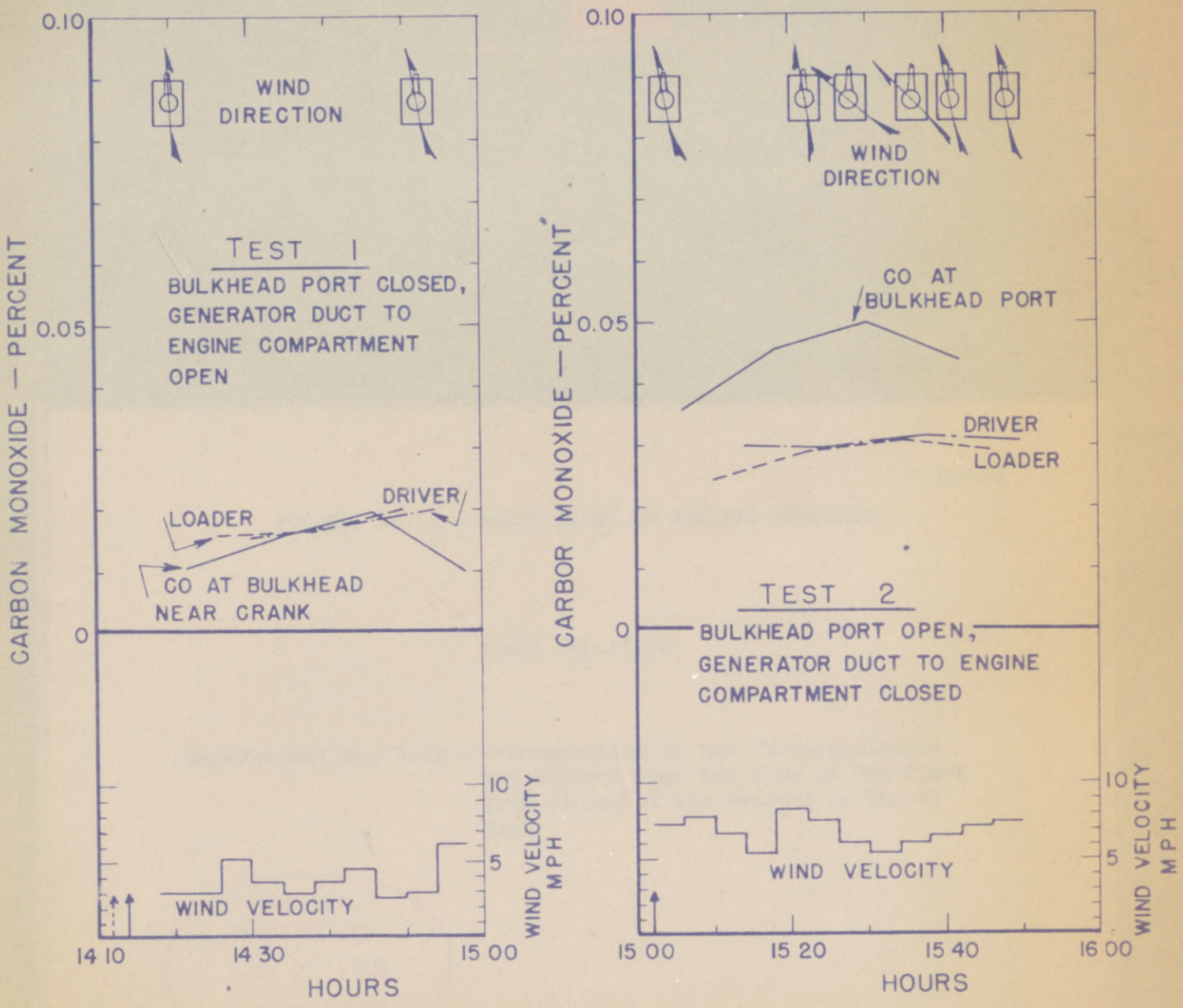



0.15
0.10
0.05
0
CARBON MONOXIDE — PERCENT
WIND DIRECTION
TEST 1
BOTH BULKHEAD PORTS OPEN
CO AT LEFT BULKHEAD PORT
LOADER
RADIATOR
WIND VELOCITY
10
5
WIND VELOCITY MPH
10 00
10 10
10 20
10 30
10 40
10 50
11 00
HOURS
WIND DIRECTION
CO AT LEFT CENTER BULKHEAD PORT
TEST 2
BOTH BULKHEAD PORTS CLOSED
LOADER
DRIVER
WIND VELOCITY
11 10
11 20
11 30
11 40
11 50
12 00
13 20
13 30
HOURS
LEGEND
CO AT BULKHEAD PORT
CO AT LOADERS POSITION
CO AT DRIVERS POSITION
AUXILIARY GENERATOR STARTED
HATCHES CLOSED

M5A1

FIG. 2





LEGEND

——— CO AS INDICATED
– – – – CO AT LOADER POSITION
—·— CO AT DRIVERS POSITION
-----→ AUXILIARY GENERATOR STARTED
——→ HATCHES CLOSED

M7

FIG. 3