

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-95-
Relating to Exemptions under Section 27156
of the Vehicle Code

SUMARI ENGINEERING INC.
"TAF PERFORMANCE VALVE"

Pursuant to the authority vested in the Air Resources Board by Section 27156 of the Vehicle Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-45-5;

IT IS ORDERED AND RESOLVED: That the installation of the "TAF Performance Valve" manufactured by Sumari Engineering, Inc., 544 West Thunderbird Road, Phoenix, Arizona 85023 has been found not to reduce the effectiveness of required motor vehicle pollution control devices and, therefore, is exempt from the prohibitions of Section 27156 of the Vehicle Code for all 1979 and older model-year vehicles with engines greater than 140 cubic inch displacement except for the following:

1. diesel powered vehicles
2. fuel injected vehicles
3. Chrysler's Lean Burn Systems
4. vehicles equipped with 3-way catalyst

This Executive Order is valid provided that installation instructions for this device will not recommend tuning the vehicle to specifications different from those submitted by the device manufacturer.

Changes made to the design or operating conditions of the device, as exempted by the Air Resources Board, that adversely affect the performance of a vehicle's pollution control system shall invalidate this Executive Order.

Marketing of this device using an identification other than that shown in this Executive Order or marketing of this device for an application other than those listed in this Executive Order shall be prohibited unless prior approval is obtained from the Air Resources Board. Exemption of a kit shall not be construed as an exemption to sell, offer for sale or advertise any components of the kit as individual devices.

This Executive Order does not constitute any opinion as to the effect that the use of this device may have on any warranty either expressed or implied by the vehicle manufacturer.

THIS EXECUTIVE ORDER DOES NOT CONSTITUTE A CERTIFICATION, ACCREDITATION, APPROVAL, OR ANY OTHER TYPE OF ENDORSEMENT BY THE AIR RESOURCES BOARD OF ANY CLAIMS OF THE APPLICANT CONCERNING ANTI-POLLUTION BENEFITS OR ANY ALLEGED BENEFITS OF THE "TAF PERFORMANCE VALVE".

No claim of any kind, such as "Approved by Air Resources Board" may be made with respect to the action taken herein in any advertising or other oral or written communication.

Section 17500 of the Business and Professions Code makes untrue or misleading advertising unlawful, and Section 17534 makes violation punishable as a misdemeanor.

Section 43644 of the Health and Safety Code provides as follows:

"43644. (a) No person shall install, sell, offer for sale, or advertise, or, except in an application to the state board for certification of a device, represent, any device as a motor vehicle pollution control device for use on any used motor vehicle unless that device has been certified by the state board. No person shall sell, offer for sale, advertise, or represent any motor vehicle pollution control device as a certified device which, in fact, is not a certified device. Any violation of this subdivision is a misdemeanor."

Any apparent violation of the conditions of this Executive Order will be submitted to the Attorney General of California for such action as he deems advisable.

Executed at El Monte, California, this 4th day of December, 1979.

K. D. Drachand
K. D. Drachand, Acting Chief
Mobile Source Control Division

State of California
AIR RESOURCES BOARD

November 5, 1979

STAFF REPORT

Evaluation of Sumari Engineering Inc. "TAF Performance Valve"
Device for Compliance with the Requirements of
Section 27156 of the California Vehicle Code

I. Introduction

Sumari Engineering Inc. 544 West Thunderbird Road, Phoenix, Arizona 85023 has submitted an application requesting an exemption from the provisions of Section 27156 of the California Vehicle Code for its "TAF Performance Valve" device for installation on all 1979 and older model year vehicles with engines greater than 140 cubic inch displacement except for the following:

1. Diesel powered vehicles
2. Fuel injected vehicles
3. Chrysler Lean Burn Systems
4. Vehicles equipped with 3-way catalyst

II. System Description

The "TAF Performance Valve" is an air bleed device that is installed in series with the PCV hose. The device uses a proportional air bleed that is controlled by means of manifold vacuum. The proportional air bleed is adjustable to suit different engine applications.

The device consists of two chambers, the upper chamber has a vacuum controlled piston connected to an adjustable plunger. A spring is positioned under the piston so that it is normally open when not in

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operation. The lower chamber has series connectors for the PCV system and a common port to the upper chamber. The common port has three 4.75 mm (3/16 inch) orifices drilled into it. These orifices allow fresh air to enter the device. The orifice outlets are covered by a porous filter of greater than 20 micron mesh.

III. System Function

In operation the vehicle is started and manifold vacuum is applied to the upper chamber which overcomes the spring tension and pulls the piston assembly down. The adjustable plunger, which is part of the piston assembly covers the orifices that allow the fresh air into the PCV system. As manifold vacuum is decreased, the spring forces the piston assembly upward and the orifices are uncovered allowing air to bleed in to the PCV system. This is caused by the pressure differential of engine operation. The amount of air that enters the PCV system is proportional to the area of the uncovered orifices.

The device is designed to be fully closed at idle, partially open at cruise and fully open at wide open throttle.

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IV. Device Testing

Sumari Engineering Inc. submitted test data prepared by W. R. Grace and Company on a 1979 Chevrolet Monte Carlo. (See Table 1). The emissions data indicate an increase in carbon monoxide (CO) and a decrease in hydrocarbons (HC), oxides of nitrogen (NOx) and fuel economy (MPG). The percentage differences in emissions data (with and without device) are considered to be within test variability.

The Air Resources Board performed confirmatory testing of the "TAF Performance Valve" at the El Monte laboratory. The test vehicle was a 1974 AMC Ambassador station wagon with a V8 engine and automatic transmission. The 1975 CVS Federal Test Procedure was used to determine emissions and fuel economy. The vehicle was in laboratory control during the entire time of the device testing. The vehicle was adjusted to OEM manufacturer specifications before baseline testing and the vehicle did not receive any adjustments or modifications between baseline and device tests except for the installation of the device according to the device manufacturer's installation instructions. The emissions results (see Table 2) indicate a decrease in CO, HC, and MPG and an increase in NOx. The percentage increase in NOx emissions is considered to be within test variability.

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The Air Resources Board also performed flow bench testing and driveability tests on the device.

The flow bench test is designed to measure the amount of air that flows through the orifices of the device during actual engine operation. This is accomplished by using an engine dynamometer, flow meter and associated hardware.

Since the device is adjustable it was subjected to three phases of flow bench testing at different adjustments. In Phases I and II the device was tested at minimum and maximum flow rates (see Figures 1 and 2). In Phase III the device was reinstalled on the test vehicle and adjusted according to the installation instructions. The device was then transferred back to the flow bench for testing. Phase III represents the flow rate of the device as installed on a vehicle (see Figure 3).

The driveability evaluation was performed by a member of the ARB staff who has received specialized training in this field. The vehicle was set to OEM specifications and driven through a prescribed test pattern. The vehicle was then fitted with the device and driven in the same manner over the same course. The evaluation is a comparison between the two tests.

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V. Discussion

Phase III of the flow bench tests revealed that the "TAF Performance Valve" had very poor repeatability. The ARB staff requested the applicant to submit additional devices for testing to ascertain whether the repeatability problem was due to the quality of the device or if the original devices were defective. The new devices were then subjected to the same flow bench tests. The test results (Phase IV) on the new valves indicated flow rates similar to the original valve except that the new valves had repeatable results (see Figure 4). The applicant informed our staff that they had made minor changes to the design of the adjustable plunger to remedy the repeatability problems. The design change is indicated on the blue prints that were submitted with the original application.

The driveability evaluation indicated no negative driveability problems associated with the device.

The advertisements that were submitted with the original application had claims of 20% better fuel economy, reduced emissions and better performance. Since the CVS test data did not indicate a 20% increase in fuel economy with the device installed, the applicant was requested to omit all such claims from their advertising

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material to be used in California concerning fuel economy. Section 43644 of the California Health and Safety Code prohibits device manufacturers from advertising their device as a pollution control device unless certified as such; therefore, the applicant dropped all reduced emissions clauses from their application.

VI. Conclusion and Recommendation

The emissions results from the two test vehicles indicated that the device did not cause an adverse effect on emissions. Furthermore, the driveability evaluation did not reveal safety or performance problems and the flow bench data exhibited repeatable results. Therefore, based on this information the staff concludes that the installation of this device on specified vehicles will not result in an increase in emissions, and recommends that the Sumari Engineering Inc. "TAF Performance Valve" be granted an exemption from the prohibitions of Section 27156 of the California Vehicle Code with the exceptions noted in the Introduction.

Table 1

LAB: W. R. Grace & Co.
 DEVICE: TAF Performance Valve

Vehicle: 1979 Chevrolet Monte Carlo
 Engine Size: 305 cubic inch displacement w/2V carburetor

<u>Test #</u>	<u>Test Type</u>	grams per mile			<u>City MPG</u>	<u>Highway MPG</u>
		<u>HC</u>	<u>CO</u>	<u>NOx</u>		
884	Baseline	.340	3.830	.994	14.684	19.762
898	Device	.380	3.440	.932	14.450	19.230
% change from baseline		+12%	-10%	-6%	-2%	-3%

Table 2

LAB: Air Resources Board
 Device: TAF Performance Valve

Vehicle: 1974 AMC Ambassador Station Wagon
 Engine Size: 360 cubic inch displacement w/2V carburetor

<u>Test #</u>	<u>Test Type</u>	grams per mile			<u>City MPG</u>	<u>Highway MPG</u>
		<u>HC</u>	<u>CO</u>	<u>NOx</u>		
AVERAGE BASELINE		1.985	18.13	2.57	12.2	16.7
2V7910A	DEVICE	1.887	13.16	2.73	12.2	15.9
% change from baseline		-5%	-27%	+6%	0	-5%

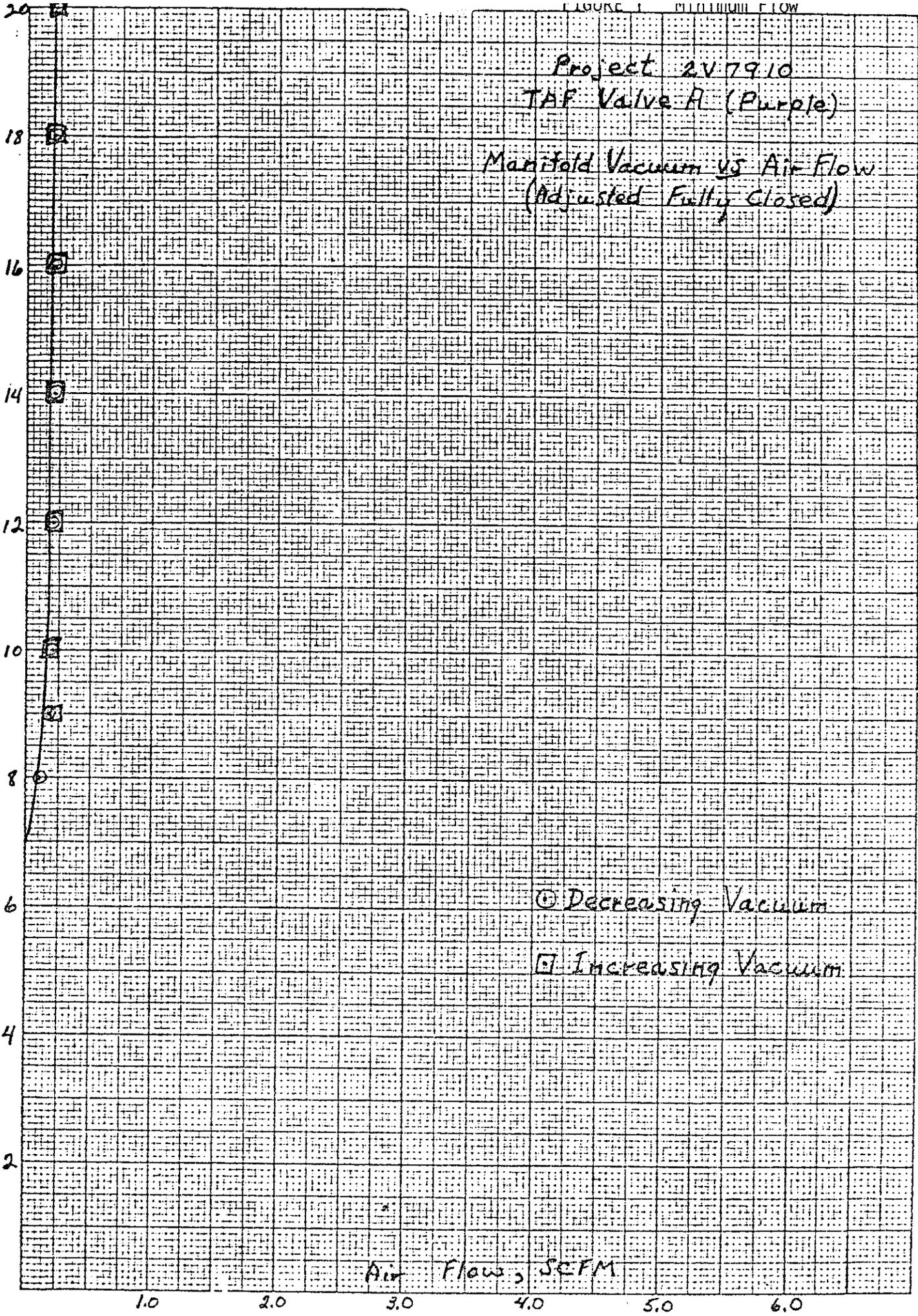
Project 2V 79.10
TAF Valve A (Purple)

Manifold Vacuum vs Air Flow
(Adjusted Fully Closed)

K&E VALVE TO THE INCH NO. 1494
1/2" X 10 INCHES
NEUFEL & ESSER CO.

Manifold Vacuum, In. Hg

Air Flow, SCFM



○ Decreasing Vacuum

□ Increasing Vacuum

K&E 20 X 20 TO THE INCH 46 1242
MADE IN U.S.A.
KEUFFEL & ESSER CO.

FIGURE 1 (B)

Project 2V7910
TAF Valve B
(Blue)

Manifold Vacuum Vs Air Flow
(Adjusted Fully Closed)
Tested 8-3-79

Manifold Vacuum, in Hg

18
16
14
12
10
8
6
4
2
0

Air Flow, SCFM

1.0 2.0 3.0 4.0 5.0 6.0

○ Decreasing Pressure
□ Increasing Pressure

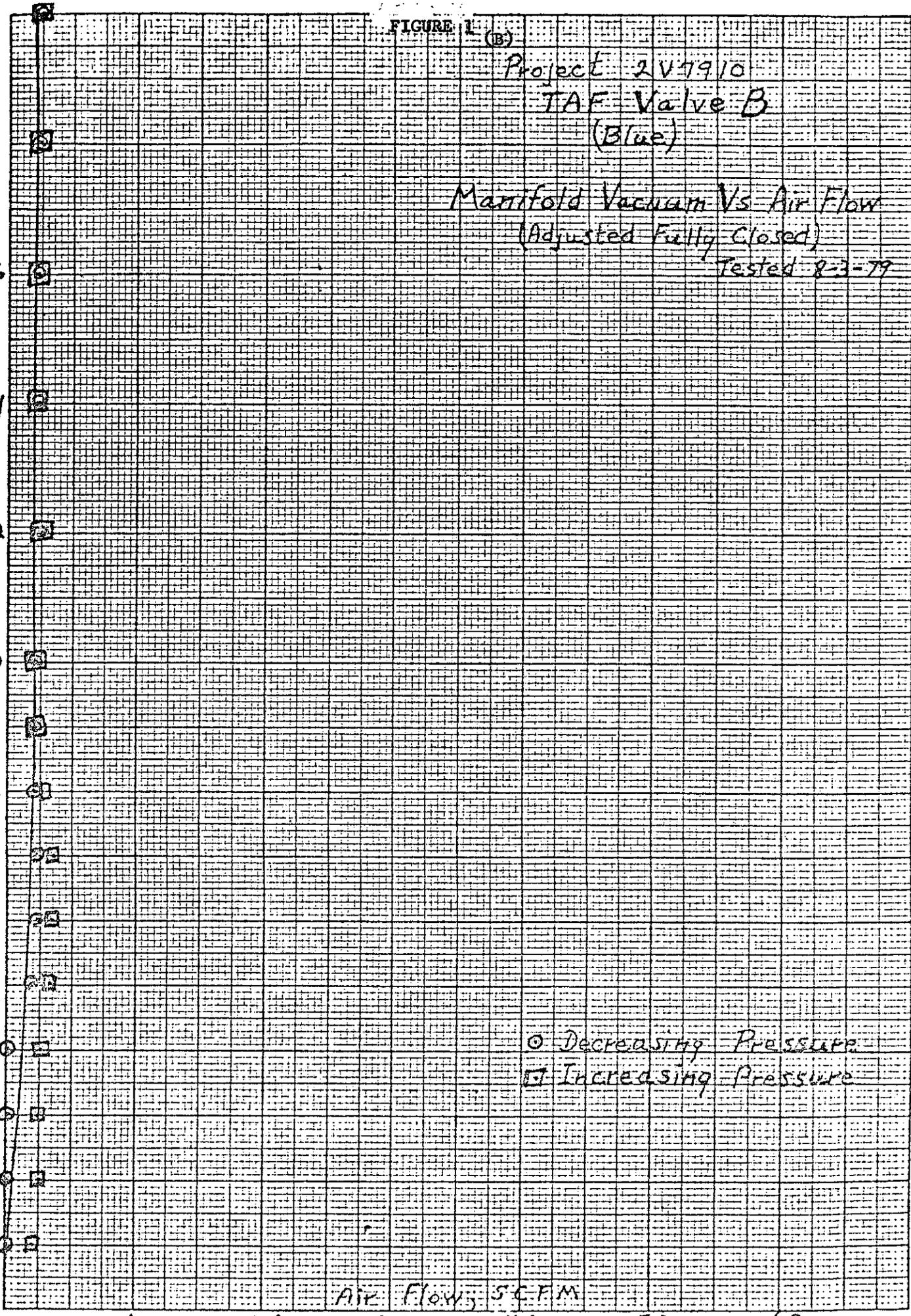


FIGURE 2 Maximum Flow

Project 2V7910

TAF Value A (Purple)

Manifold Vacuum VS Air Flow

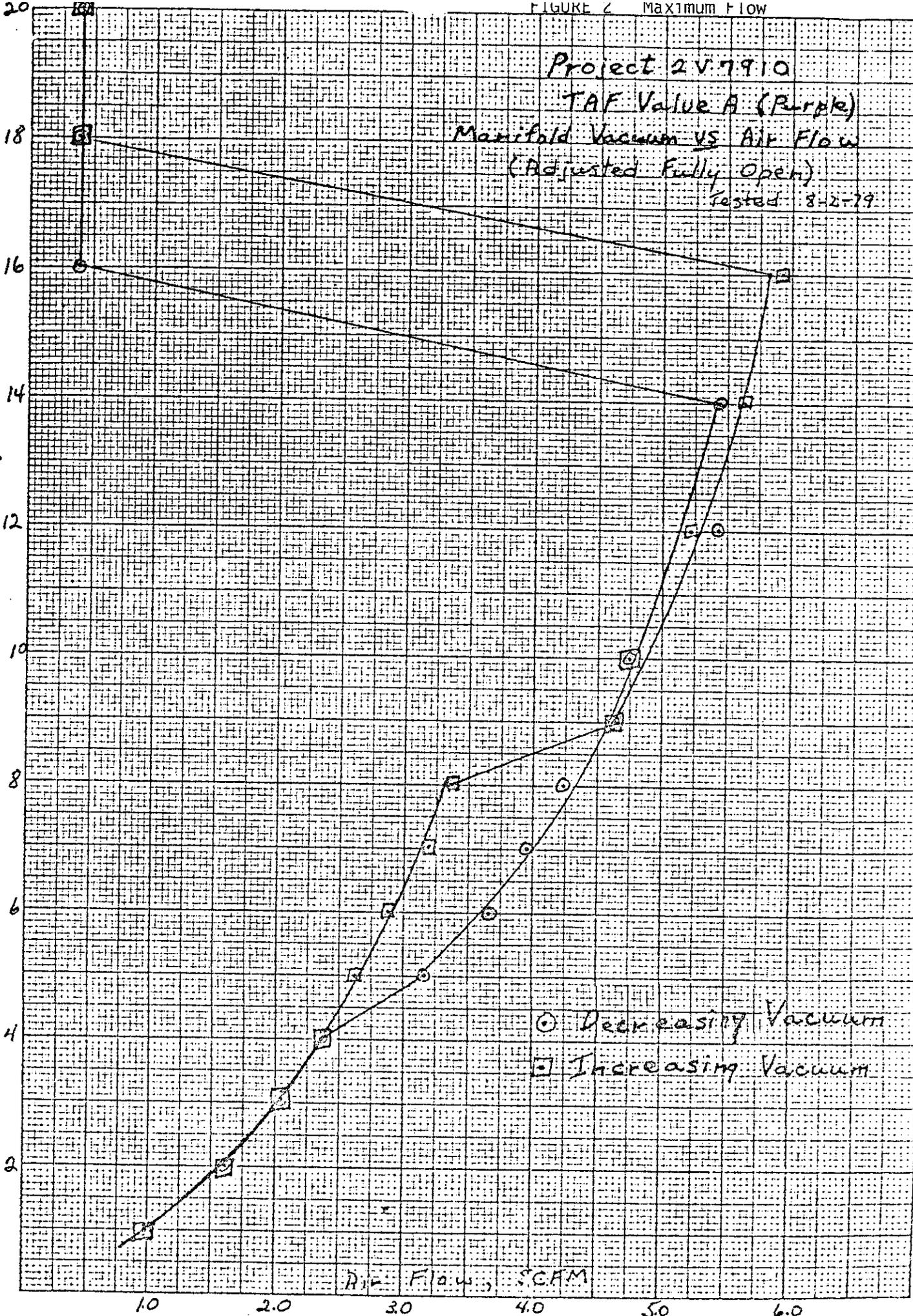
(Adjusted Fully Open)

Tested 8-2-79

Manifold Vacuum, In. Hg

Air Flow, SCFM

K&E 20 X 20 TO THE INCH 48.124Z
PART IN U.S.A.
KEUFFEL & ESSER CO.



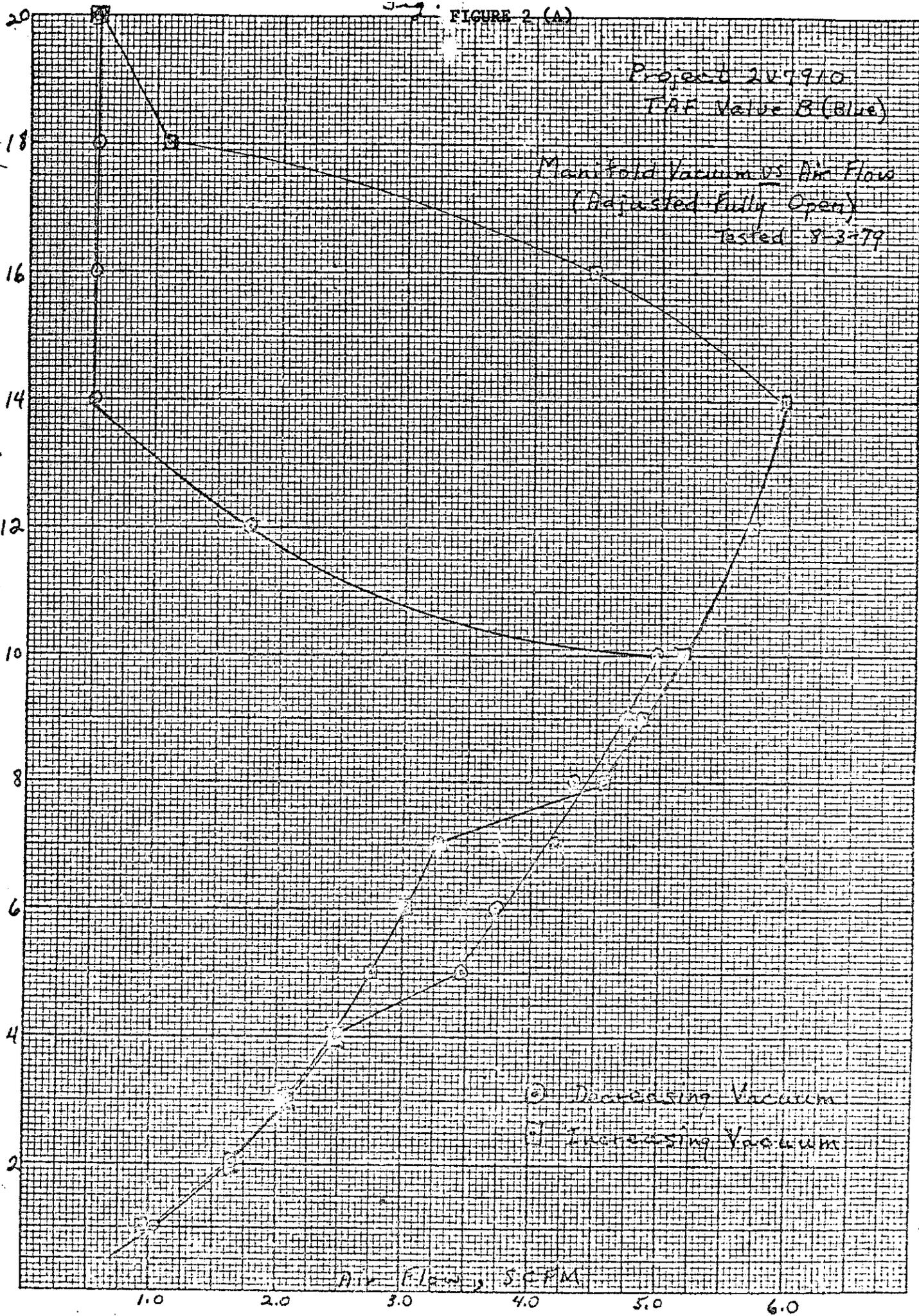
K&E 4" A 20 TO THE INCH 40 1242
MADE IN U.S.A.
KEUFFEL & ESSER CO.

Manifold Vacuum, In. Hg

FIGURE 2 (A)

Project 2V7910
TAF Valve B (Blue)

Manifold Vacuum vs Air Flow
(Adjusted Fully Open)
Tested 9-3-79



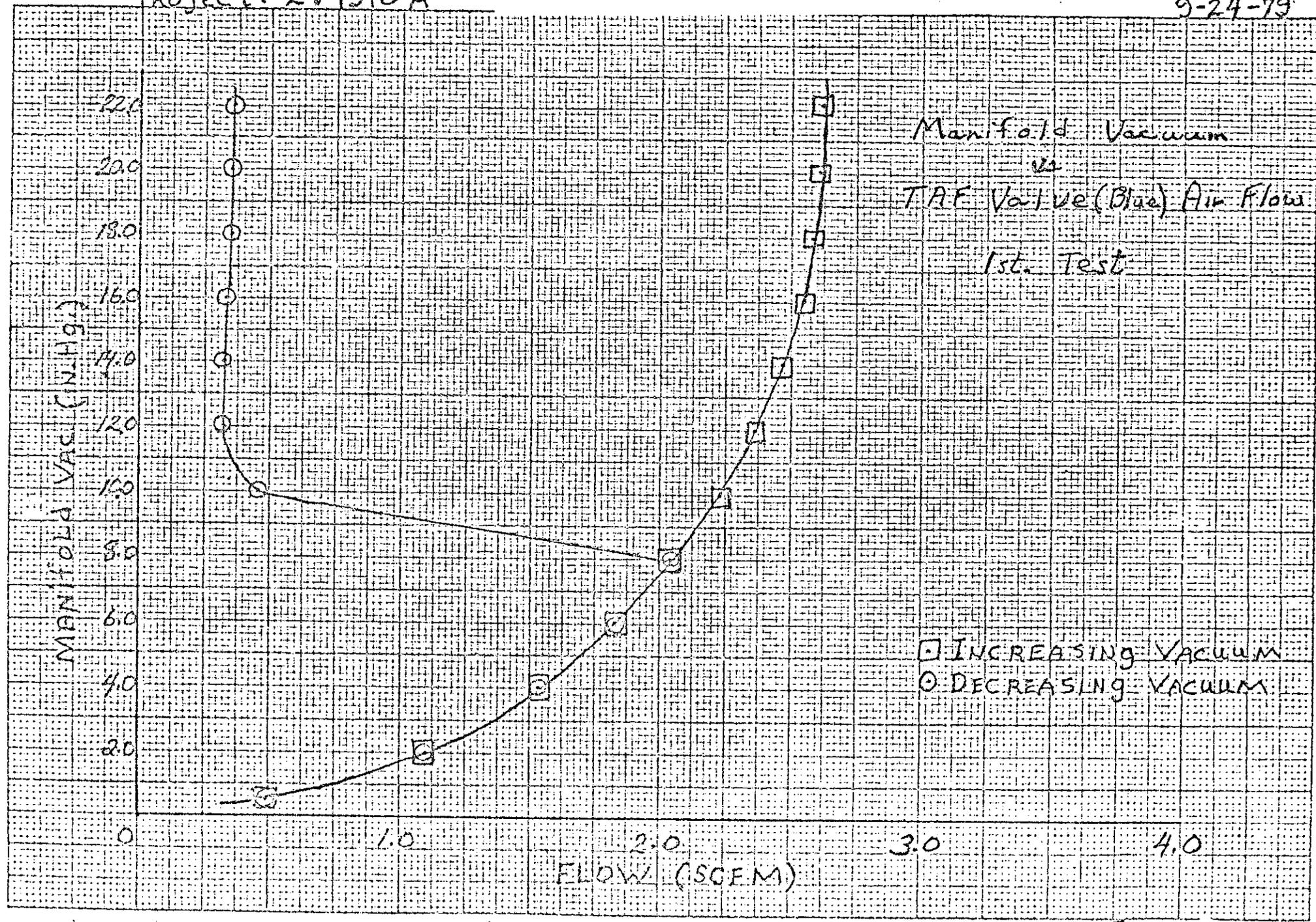
○ Decreasing Vacuum
□ Increasing Vacuum

Air Flow, SCFM

FIGURE Non-Repeatable Results

Project: 2V7910A

9-24-79



Project: 2V7910A

9-24-79

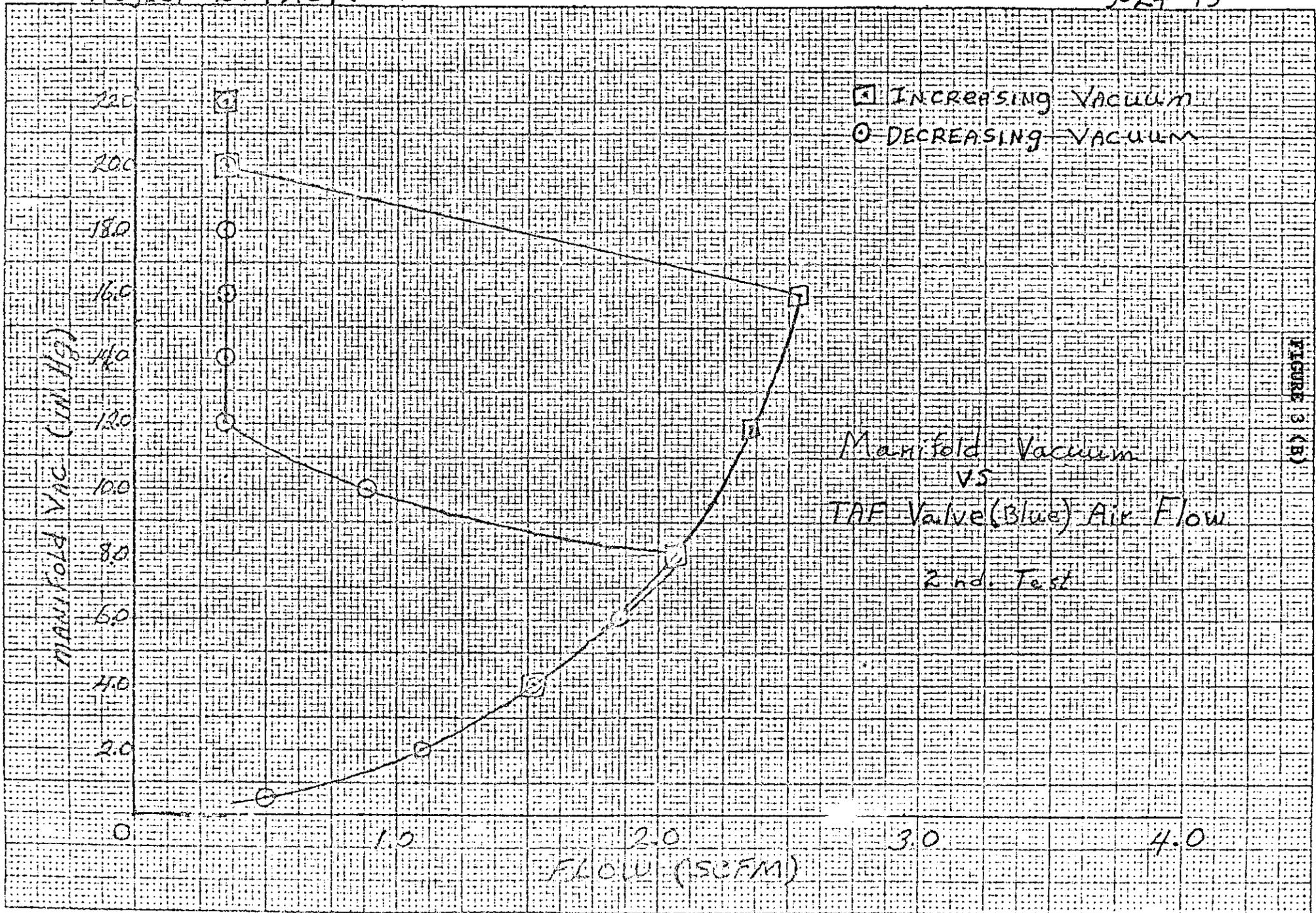
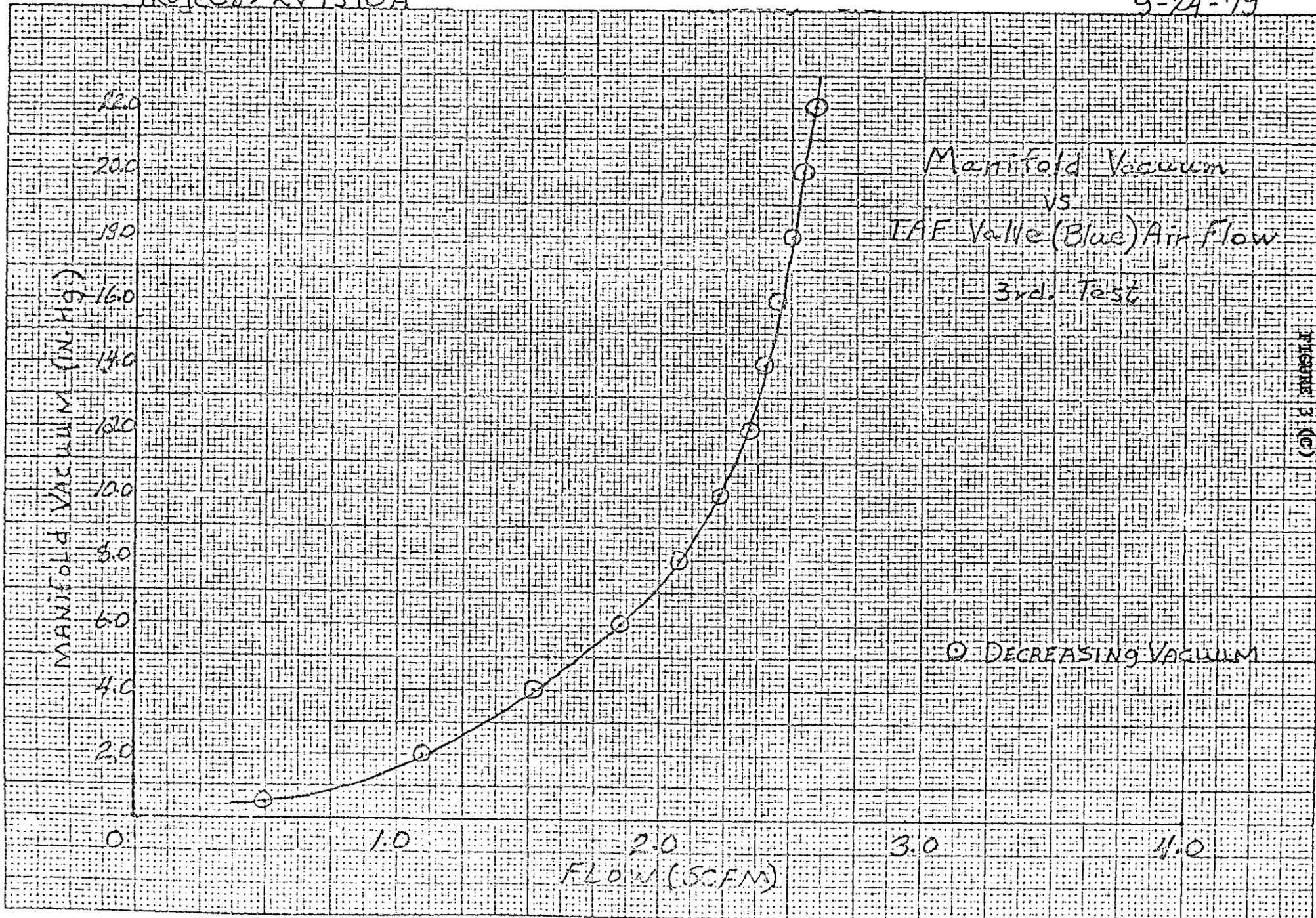


FIGURE 3 (B)

Project: 2V7910A

9-24-79



Project 2V7910R

9-28-79

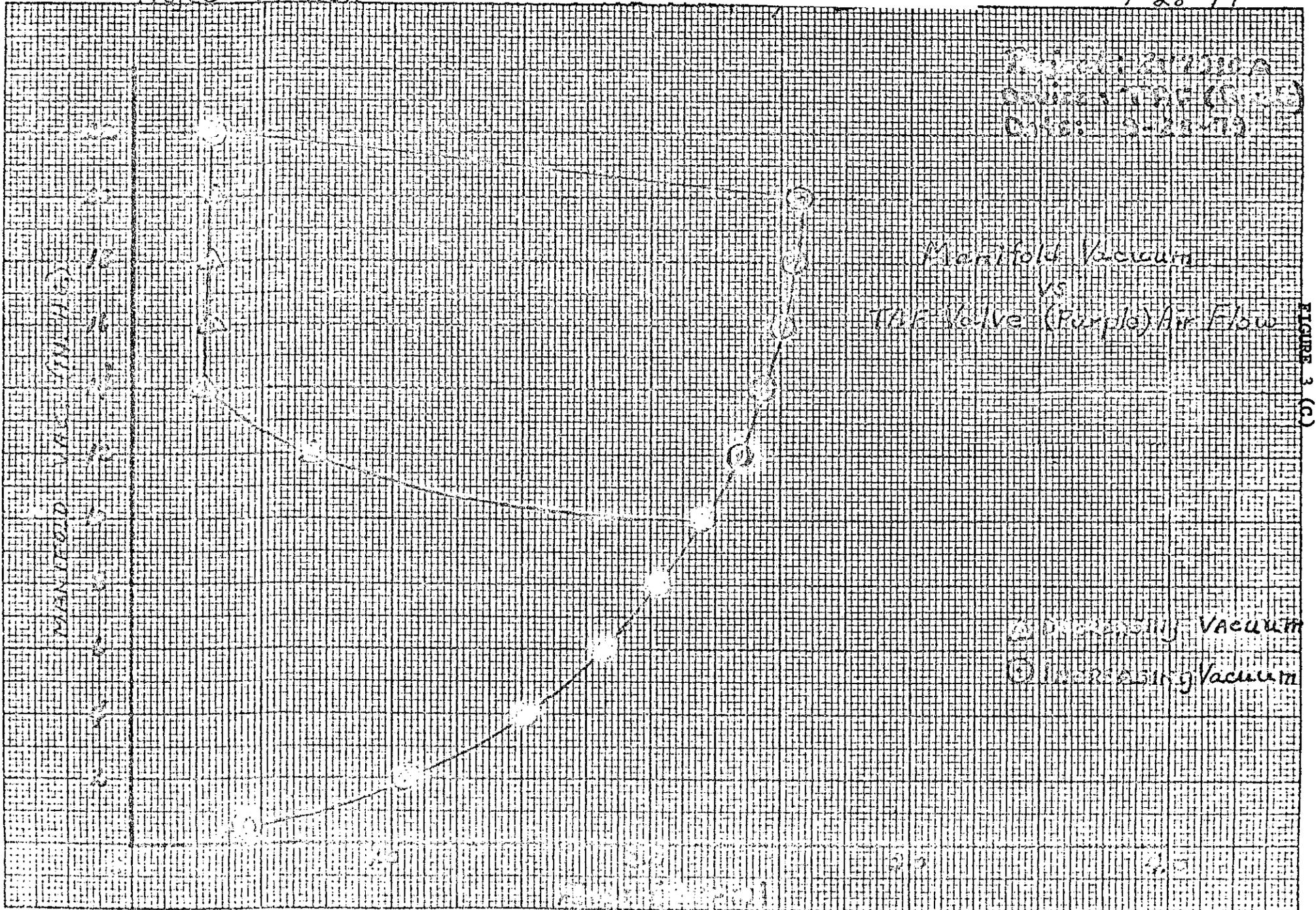


FIGURE 3 (C)

Project : 2V7910 A

Date : 10-22-79

Device : TAF VALVE
(Blue - A)

Mode : 8 Turns Out

FIGURE 4 Repeatable Results

MANIFOLD VACUUM (in. Hg.)

