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To: Mr. Leo F. Meyer

Date: September 17, 1975

From: Barbro Goodman

Subject: Marlboro - Marlboro Lights Study Delivery Data

INTRODUCTION

On January 3, 1975 a memo was sent to you concerning smoker profiles collected in the Marlboro - Marlboro Lights study. Since that time we have been able to use the Smoker Simulator in determining a series of TPM deliveries. Included in these smokings were cigarettes from the study above.

DISCUSSION

The smoker profile data reported earlier indicated that Marlboro Lights cigarettes were not smoked like regular Marlboros. There were differences in the size and frequency of the puffs, with larger volumes taken on Marlboro Lights by both regular Marlboro smokers and Marlboro Lights smokers. There were a total of nine smokers participating in the study, which spanned a period of four weeks. The first two weeks they smoked their regular brand and then switched exclusively to the alternate cigarette (Marlboro 85 or Marlboro Lights). The average smoker parameters for the cigarettes smoked on recording units are listed in Table I. The parameter information was obtained by Multi-variate Statistical Analysis, a method of averaging which takes into account the fact that all smokers do not take the same number of puffs. The analysis evaluates each puff according to the total number of puffs on the cigarette rather than giving equal weight to all puffs. Command tapes for Simulator smokings were based on these averages of puff volumes, puff durations, maximum flow rates and the intervals between puffs. The observed arithmetic means of the smoker parameters are illustrated in Figures 1 - 4 for the first nine puffs on both cigarettes.

The Simulator smokings of production Marlboro 85 and Marlboro Lights cigarettes were divided into three stages:

- A. Command tapes based on data from the entire group of smokers (Tapes #17 and 39).
- B. Command tapes based on data from regular Marlboro 85 smokers only (Tapes #40 and 27).
- C. Command tapes based on data from Marlboro Lights smokers only (Tapes #34 and 35).

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A. The Marlboro 85 cigarettes were smoked on the Simulator with varying parameters. The puff volumes ranged from 49 to 38 cc. TPM delivery was 24.7 mg, which is equal to C.I. puff by puff delivery for the same number of puffs (Tables II and III).

Marlboro Lights, on the other hand, delivered 19.6 mg TPM on the Simulator with puff volumes ranging from 55 to 43 cc. C.I. puff by puff TPM delivery for eight 35 cc puffs was 15 mg (Table III).

There were several possible reasons why the Marlboro Lights delivered more TPM to the smoker than C.I. values would indicate while Marlboro 85's showed no increase in delivery from the Simulator smokings: (1) the larger puff volumes taken on Marlboro Lights cigarettes, (2) a change in filter efficiency when the test cigarettes were smoked at higher than usual flow rates, (3) the faster burning paper on Marlboro Lights put the last puff closer to the filter where the TPM delivery is higher.

B. The smoker parameters were also grouped by the smokers' regular brands. The subjects smoking Marlboro 85 as their regular brand took significantly larger puffs than the Marlboro Lights smokers. The differences in puff sizes are contributing directly to the variations in TPM deliveries between the two groups of smokers as shown in Table IV.

The Marlboro 85 smokers' tapes (numbered 40 and 27) contained data not significantly different from each other. Therefore, they would also be expected to give similar levels of TPM for Marlboro 85 and Marlboro Lights cigarettes. Smoked on the Simulator, they both delivered 27.8 mg TPM (Table IV).

C. The tapes generated by Marlboro Lights smokers (numbered 34 and 35) had short puff durations and intervals, even shorter than the standard C.I. puffs. The short intervals and the low volumes contributed to low deliveries from these Simulator smokings. Marlboro Lights delivered 17.9 mg TPM to the smoker and Marlboro 85, which was smoked with the smallest puffs (38.6-27 cc), delivered only 16.5 mg TPM on 9 puffs.

CONCLUSIONS

The smoker data collected in this study are in agreement with results found in other project studies. The panelists smoked the cigarettes according to physical properties; i.e., the dilution and the lower RTD of Marlboro Lights caused the smokers to take larger puffs on that cigarette than on Marlboro 85's. The larger puffs, in turn, increased the delivery of

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Marlboro Lights proportionally. In effect, the Marlboro 85 smokers in this study did not achieve any reduction in smoke intake by smoking a cigarette (Marlboro Lights) normally considered lower in delivery. Conversely, the Marlboro Lights smokers did not increase their smoke intake when they changed to the regular delivery cigarette.

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TABLE I
COMMAND TAPE INPUT DATA - SMOKER AVERAGES

Cigarette Smoked By Panelist	Command Tape	Puff Parameter	1	2	3	4	5	6	7	8	9	Average
Marlboro 85	#17 ¹	Volume, cc	49.2	47.8	46.4	45.0	43.6	42.2	40.8	39.4	38.0	44.27
		Duration, sec.	2.14	2.05	1.96	1.87	1.78	1.69	1.60	1.51	1.42	1.83
		Interval, sec.	--	37.2	40.6	44.0	47.4	50.9	54.3	57.7	61.1	45.74
		Max. Flow, cc/min.	2326	2369	2413	2456	2499	2543	2586	2630	2673	2478
Marlboro Lights	#39	Volume, cc	55.1	53.5	51.8	50.1	48.4	46.7	45.1	43.4	41.7	49.25
		Duration, sec.	2.16	2.08	2.00	1.92	1.84	1.76	1.68	1.60	1.52	1.88
		Interval, sec.	--	29.6	35.1	40.5	46.0	51.5	57.0	62.4	67.9	43.28
		Max. Flow, cc/min.	2601	2625	2649	2674	2698	2723	2747	2772	2796	2686
Marlboro 85	#40	Volume, cc	56.9	55.5	54.2	52.8	51.4	50.0	48.6	47.3	45.9	52.77
		Duration, sec.	2.33	2.25	2.17	2.09	2.01	1.93	1.85	1.77	1.69	2.09
		Interval, sec.	--	42.9	46.0	49.0	52.1	55.1	58.2	61.2	64.2	49.02
		Max. Flow, cc/min.	2532	2583	2634	2685	2736	2787	2838	2889	2940	2685
Marlboro Lights	#27	Volume, cc	59.6	58.3	56.9	55.6	54.2	52.9	51.5	50.2	48.9	55.59
		Duration, sec.	2.33	2.27	2.21	2.15	2.09	2.03	1.97	1.91	1.85	2.15
		Interval, sec.	--	36.0	41.6	47.3	52.9	58.6	64.2	69.8	75.4	47.27
		Max. Flow, cc/min.	2636	2662	2688	2714	2741	2767	2793	2819	2845	2714
Marlboro Lights	#34	Volume, cc	48.7	46.6	44.5	42.4	40.3	38.2	36.1	34.0	31.9	41.32
		Duration, sec.	1.89	1.79	1.69	1.59	1.49	1.39	1.29	1.19	1.09	1.54
		Interval, sec.	--	25.1	30.4	35.7	40.9	46.2	51.5	56.7	62.0	38.29
		Max. Flow, cc/min.	2572	2595	2617	2640	2662	2684	2707	2729	2752	2651
Marlboro 85	#35	Volume, cc	38.6	37.2	35.8	34.3	32.9	31.5	30.1	28.7	27.3	33.64
		Duration, sec.	1.84	1.74	1.64	1.54	1.44	1.34	1.24	1.14	1.04	1.49
		Interval, sec.	--	32.0	35.9	39.7	43.6	47.4	51.3	55.2	59.0	41.64
		Max. Flow, cc/min.	2099	2133	2167	2201	2235	2269	2303	2337	2371	2218

¹Category of Smokers listed in Table II.

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DATA SHOWS SMOKERS SWITCHING FROM MARLBORO ("MR6") TO MARLBORO LIGHTS ("ML6") INHALE MORE TAR IN PHILIP MORRIS TESTING

TABLE II
TOTAL DELIVERIES OF MARLBORO 85 AND MARLBORO LIGHTS
HUMAN SMOKER SIMULATOR

Command Smoker Tape No.	Cigarette Smoked	TPM (mg)	Tar (mg)	Nicotine (mg)	Water (mg)	Puff Count
17	MR6	24.7	20.2	1.5	3.0	9
39	ML6	22.5	17.8	1.4	3.3	9
40	MR6	27.8	21.7	1.4	4.7	8
27	ML6	27.8	22.1	1.4	4.3	8
34	ML6	17.9	15.2	1.1	1.6	9
35	MR6	16.5	14.3	.9	1.3	9

C.I. PUFF BY PUFF MACHINE

MR6	24.5	19.5	1.4	3.6	9
ML6	14.9	12.7	1.0	1.2	8

FTC METHOD SHOWS UNREALISTIC RESULTS AND MISLEADS SMOKERS

NOTE:

- Tape #17 contains parameter data for all smokers as they smoked Marlboro 85
- Tape #39 contains parameter data for all smokers as they smoked Marlboro Lights
- Tape #40 contains parameter data for Marlboro 85 smokers as they smoked Marlboro 85
- Tape #27 contains parameter data for Marlboro 85 smokers as they smoked Marlboro Lights
- Tape #34 contains parameter data for Marlboro Lights smokers as they smoked Marlboro Lights
- Tape #35 contains parameter data for Marlboro Lights smokers as they smoked Marlboro 85
- MR6 = Marlboro 85
- ML6 = Marlboro Lights

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TABLE III
 PUFF BY PUFF DELIVERIES FOR
 MARLBORO 85 AND MARLBORO LIGHTS - ALL SMOKERS

Cigarette Model	% Recovery	Puff by Puff Delivery (mg)									Total Dely. (mg)	Dely. at 100% Recovery	
		1	2	3	4	5	6	7	8	9			
MR6 Simulator Tape #17	103.5	1.94	2.38	2.68	2.85	2.97	2.90	3.23	3.24	3.42	25.61	24.74	TPM
		.10	.15	.17	.18	.19	.18	.19	.18	.18	1.52	1.47	Nic.
		.17	.20	.25	.30	.34	.34	.41	.50	.63	3.14	3.03	H ₂ O
		1.67	2.03	2.26	2.37	2.44	2.38	2.63	2.56	2.61	20.95	20.24	Tar
ML6 Simulator Tape #39	104.0	1.78	2.38	2.42	2.65	2.71	2.75	2.73	3.01	2.94	23.37	22.47	TPM
		.09	.14	.15	.17	.18	.19	.18	.19	.17	1.46	1.40	Nic.
		.29	.26	.27	.33	.32	.36	.46	.58	(.58) ¹	3.45	3.32	H ₂ O
		1.40	1.98	2.00	2.15	2.21	2.20	2.09	2.24	(2.19)	18.46	17.75	Tar
MR6 C.I. Lab Smokings		1.66	2.05	2.27	2.44	2.51	2.73	2.89	3.38	4.52	24.45	24.45	TPM
		.10	.13	.14	.16	.16	.17	.18	.19	.18	1.40	1.40	Nic.
		.19	.25	.20	.26	.24	.26	.32	.52	1.34	3.58	3.58	H ₂ O
		1.37	1.67	1.93	2.02	2.11	2.30	2.39	2.67	3.00	19.46	19.46	Tar
ML6 C.I. Lab Smokings		1.25	1.58	1.62	1.80	1.89	2.12	2.21	2.45	--	14.92	14.92	TPM
		.08	.09	.11	.12	.13	.14	.14	.15	--	.96	.96	Nic.
		.10	.15	.12	.14	.17	.15	.17	.23	--	1.23	1.23	H ₂ O
		1.07	1.34	1.39	1.54	1.59	1.83	1.90	2.07	--	12.73	12.73	Tar

¹Data estimated.

MR6 = Marlboro 85

ML6 = Marlboro Lights

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TABLE IV

SIMULATOR DELIVERIES FOR MARLBORO 85 AND MARLBORO LIGHTS SMOKER GROUPS

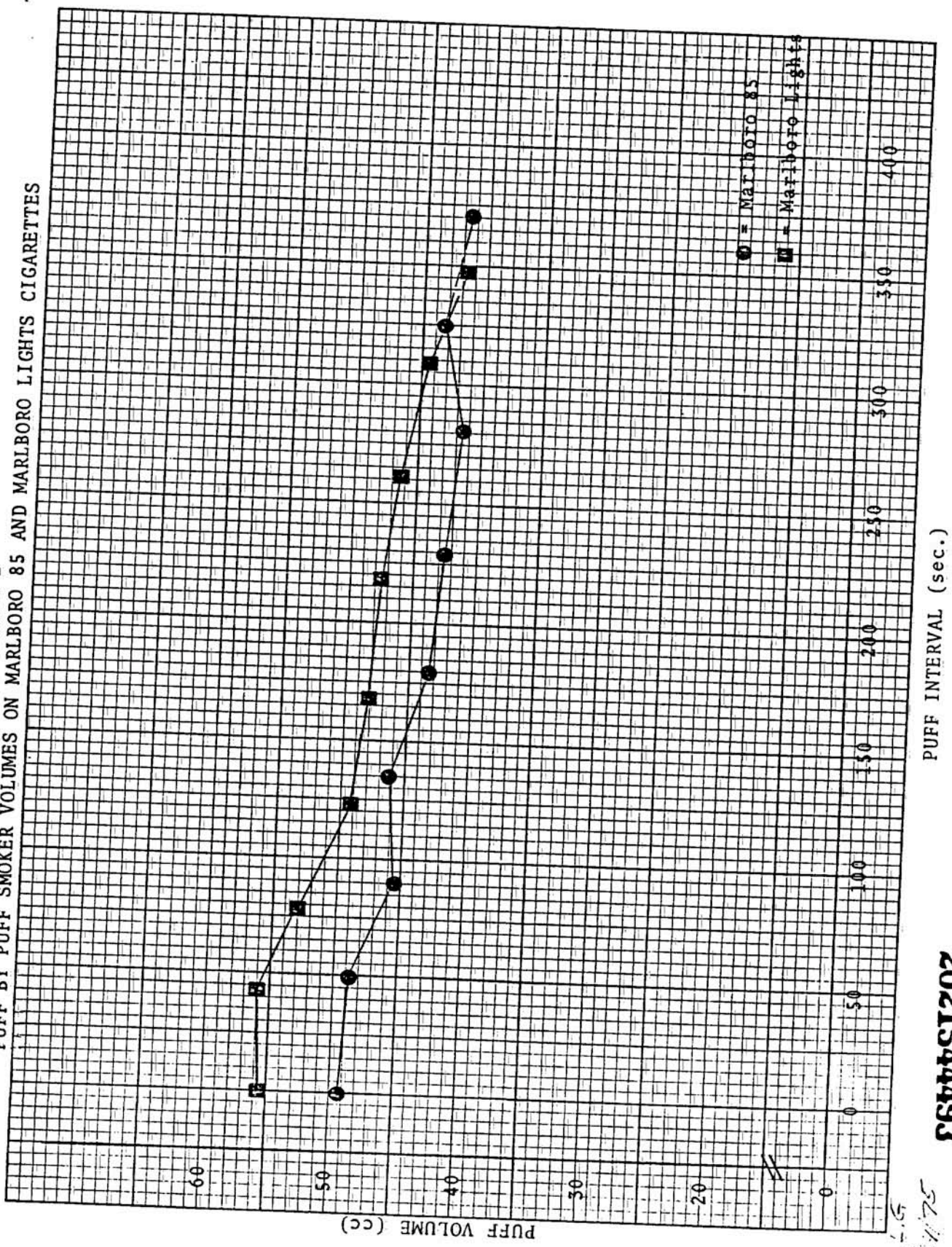
Smoker Group	Cigarette Smoked	% Re-covery	1	2	3	4	5	6	7	8	9	Total TPM Delivery (mg)	TPM Delivery at 100% Re-covery (mg)
MF 85	MF85 Tape #40	103.3	2.64	3.21	3.13	3.41	3.38	3.72	3.92	4.76		28.2	27.3
MF 85	MF85 Tape #40	105.7	2.82	3.28	3.33	3.37	3.62	3.75	4.22	5.58		29.9	28.3
													Avg. 27.8
MF 85	ML6 Tape #27	101.9	2.34	2.57	2.94	3.07	3.39	3.35	3.77	3.91		25.3	24.8
MF 85	ML6 Tape #27	99.6	2.86	3.19	3.44	3.76	3.29	4.24	4.39	5.33		30.5	30.7
MF 85	ML6 Tape #27	106.7	2.62	2.82	3.36	3.58	3.79	3.83	4.51	5.26		29.8	27.9
													Avg. 27.8
ML 6	ML6 Tape #34	100.0	1.73	1.92	1.90	2.11	1.97	2.13	2.01	1.96	2.16	17.9	17.9
ML 6	MF85 Tape #35	105.9	1.63	1.89	1.96	1.94	2.08	1.92	2.12	1.98	2.01	17.5	16.5

MR85 = Marlboro 85

ML6 = Marlboro Lights

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FIGURE 1
PUFF BY PUFF SMOKER VOLUMES ON MARLBORO 85 AND MARLBORO LIGHTS CIGARETTES



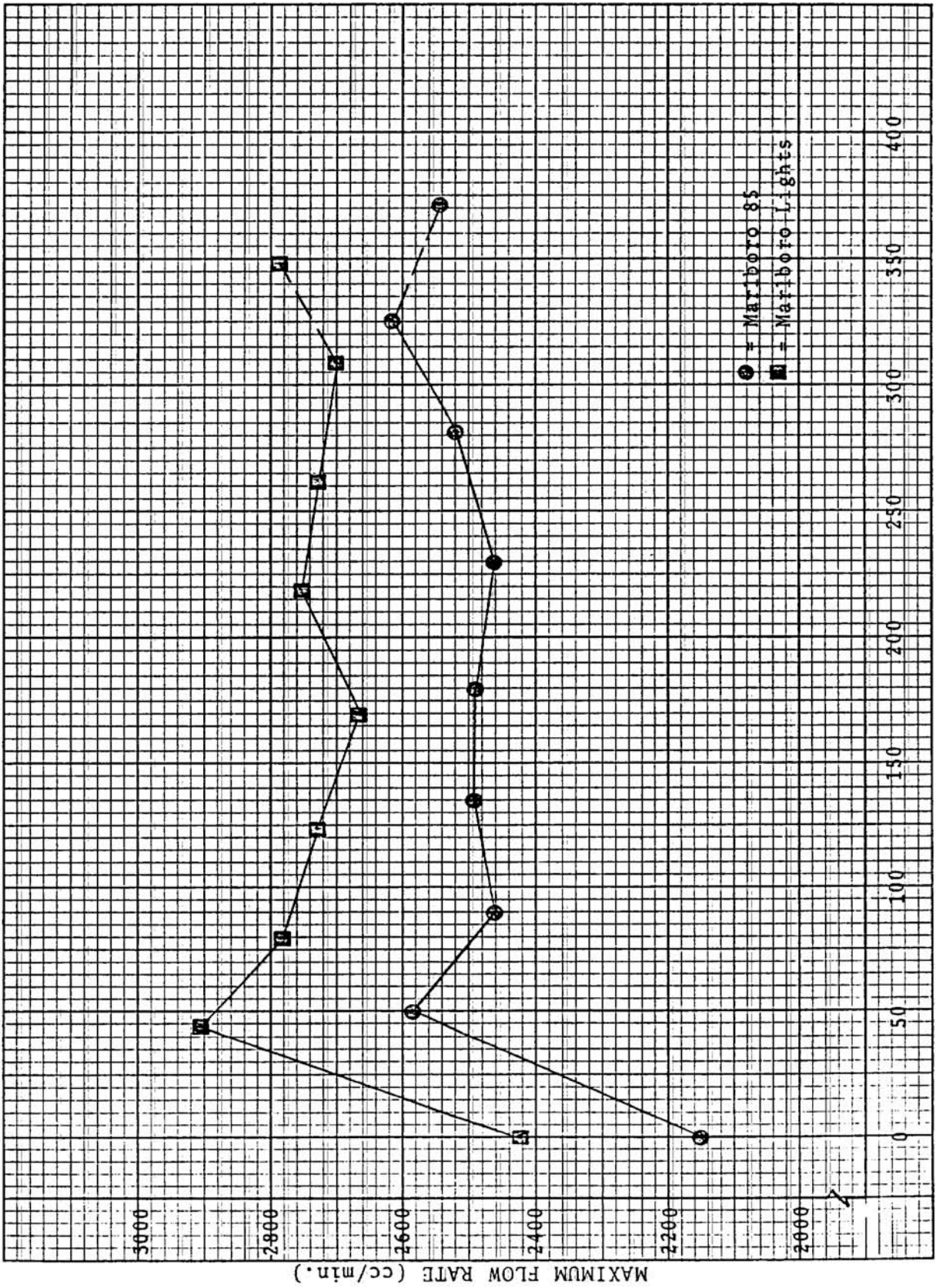
PUFF INTERVAL (sec.)

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3.5.5
4/1/75

FIGURE 2

PUFF BY PUFF MAXIMUM FLOW RATES ON MARLBORO 85 AND MARLBORO LIGHTS CIGARETTES

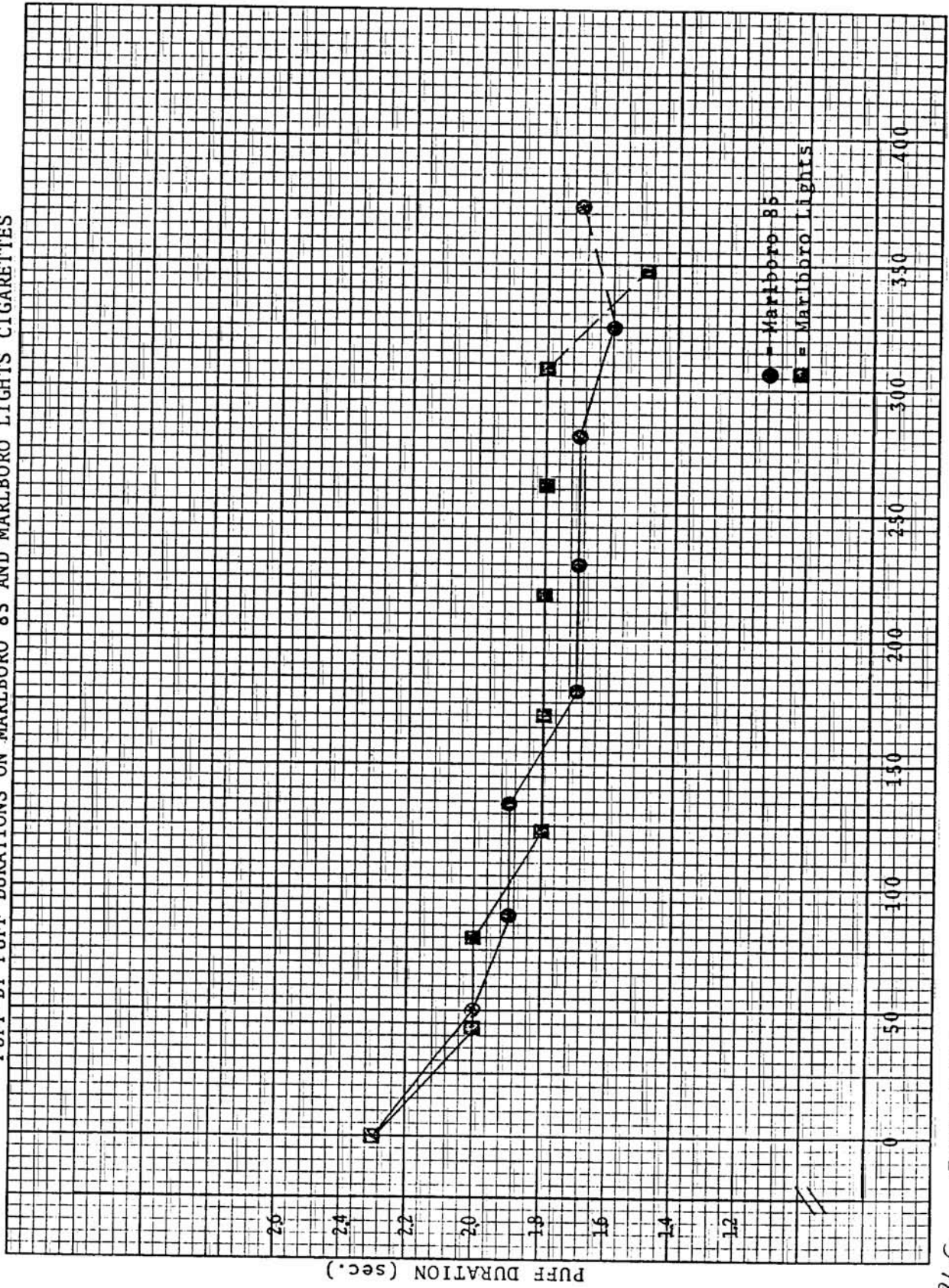


PUFF INTERVAL (sec.)

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B.L.S.
Director

FIGURE 3
PUFF BY PUFF DURATIONS ON MARLBORO 85 AND MARLBORO LIGHTS CIGARETTES

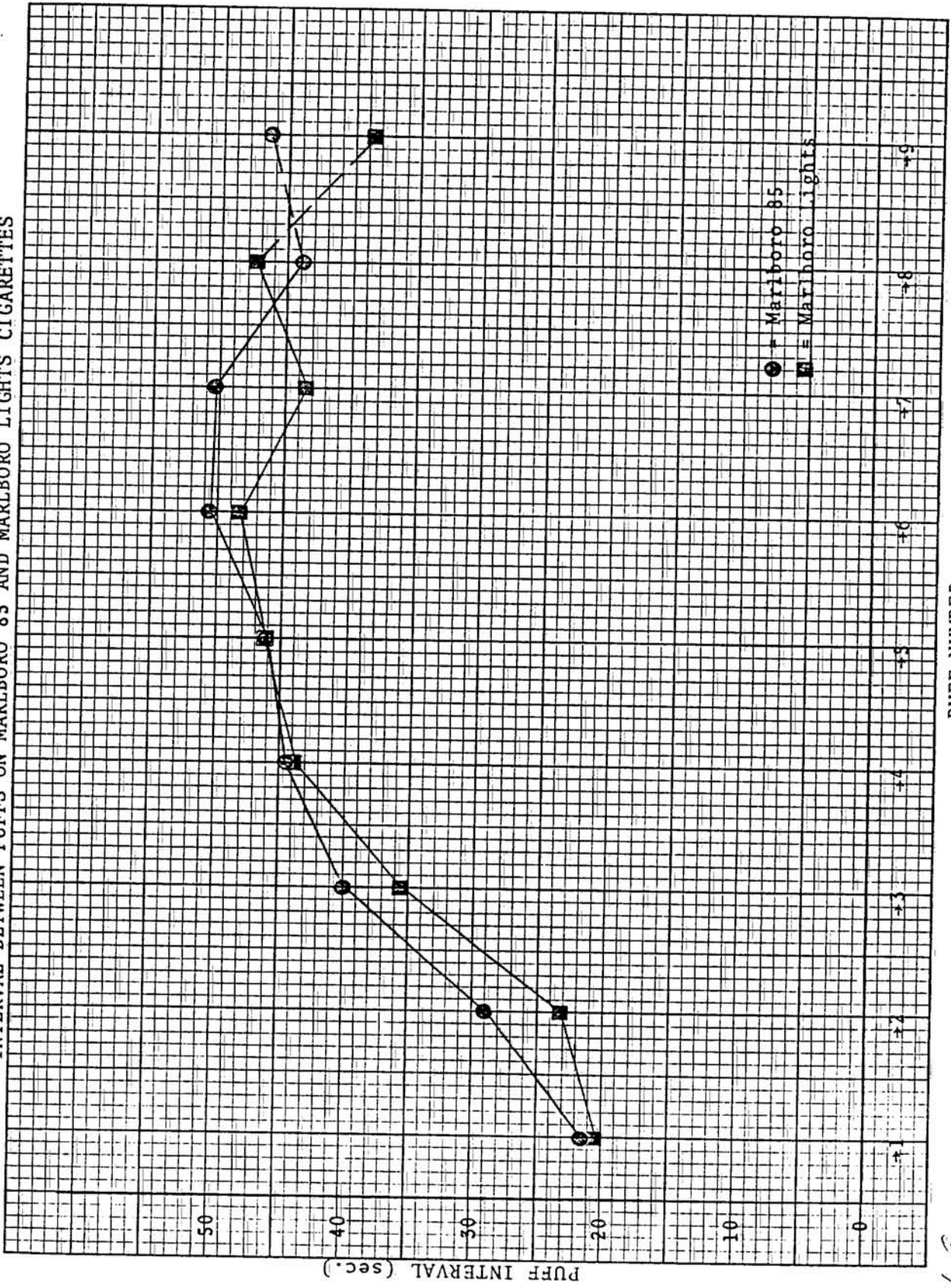


PUFF INTERVAL (sec.)

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DLG
2/10/70
570

FIGURE 4
INTERVAL BETWEEN PUFFS ON MARLBORO 85 AND MARLBORO LIGHTS CIGARETTES



PUFF NUMBER

2021544496

5/10/5
5-7-82