AIR DROP TESTS

WILLOWS, SANTA ANA, RAMONA 1955-59

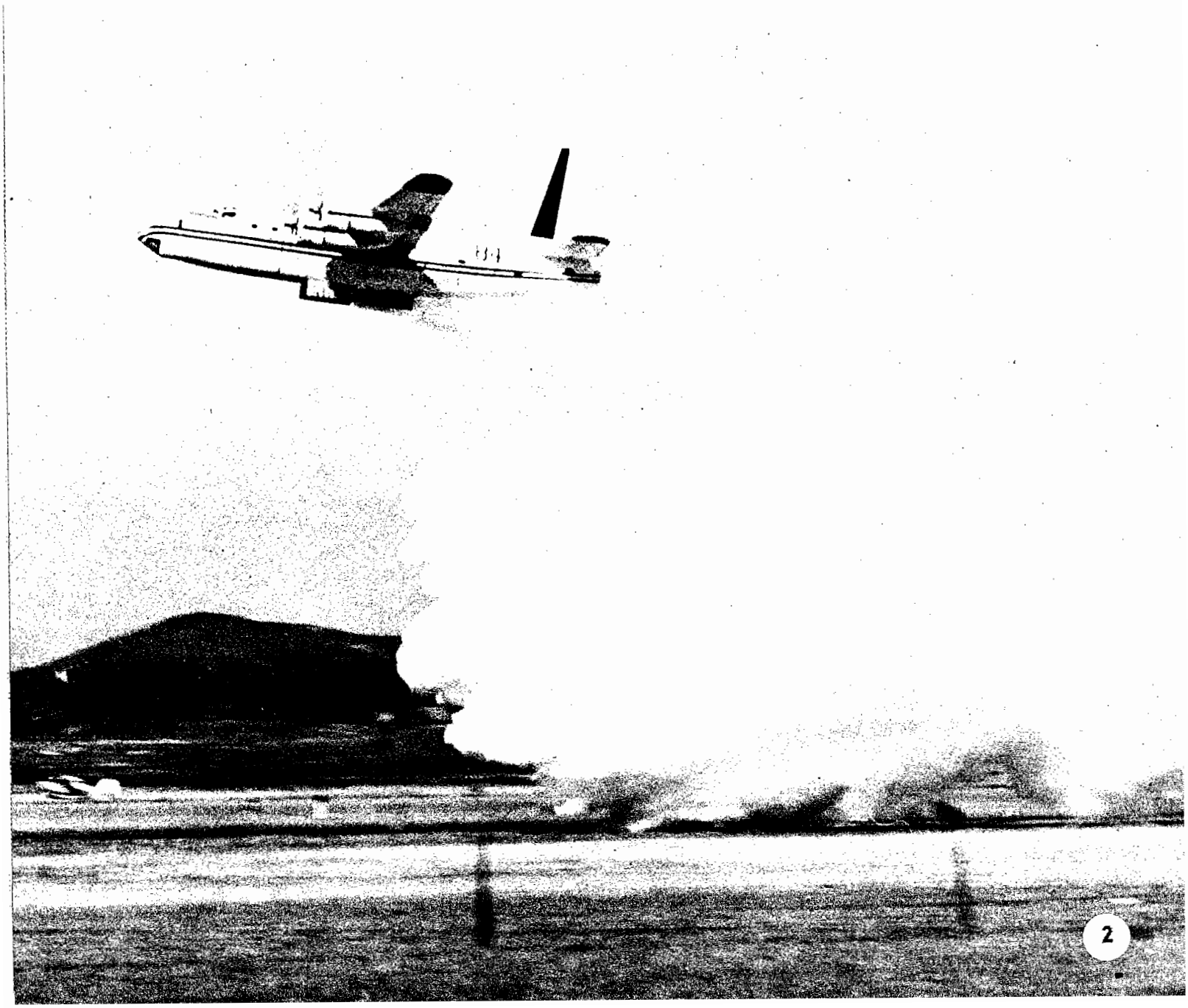
A REPORT FOR
THE CALIFORNIA AIR ATTACK
COORDINATING COMMITTEE
BY JAMES DAVIS

IN 1956 A GROUP OF NORTHERN CALIFORNIA PILOTS, EXPERIENCED IN AGRICULTURAL AVIATION, TOOK ON THE JOB OF FIGHTING FOREST FIRES FROM THE AIR. IN THAT FIRST YEAR, THEIR FLEET OF SEVEN BIPLANES DROPPED 150,000 GALLONS OF WATER AND FIRE RETARDANT ON 25 FIRES IN CALIFORNIA.

IN 1959 FOUR FIRE SEASONS LATER, THE FLEET OF SEVEN PLANES HAD GROWN TO MORE THAN 100 AND ABOUT 4 MILLION GALLONS OF RETARDANT CHEMICALS WERE DROPPED THROUGHOUT THE WESTERN STATES AND ALASKA.

SODIUM CALCIUM BORATE, A REFINEMENT OF ONE OF THE MANY CHEMICALS TESTED AT OPERATION FIRESTOP WAS THE FIRST RETARDANT TO BE PUT INTO GENERAL OPERATIONAL USE. BORATE PROVED TO BE AN EFFECTIVE FIRE RETARDANT. IT IS THE MATERIAL WITH WHICH THE AIR ATTACK PROGRAM WAS PIONEERED.

FROM LABORATORY TESTS AND PRELIMINARY AIR DROPS MADE IN 1958 IT APPEARED THAT BENTONITE CLAY, A MATERIAL COMMONLY USED AS OIL WELL DRILLING MUD, WAS ALSO A GOOD RETARDANT. BENTONITE WAS PUT INTO USE IN THE SUMMER OF 1959 DURING WHAT PROVED TO BE ONE OF THE WORST FIRE YEARS IN CALIFORNIA HISTORY.



SELDOM HAVE NEW EQUIPMENT AND METHODS BEEN PUT INTO WIDESPREAD USE SO SOON. MEN RESPONSIBLE FOR FIRE CONTROL PLANNING SUDDENLY FOUND THEMSELVES DEALING WITH A NEW--AND EXPENSIVE--TOOL.

AS THE USE OF AIR TANKERS INCREASED AND NEW RETARDANT MATERIAL BECAME AVAILABLE A NUMBER OF IMPORTANT QUESTIONS HAD TO BE ANSWERED:

1. DOES VISCOSITY AFFECT DROP BEHAVIOR?

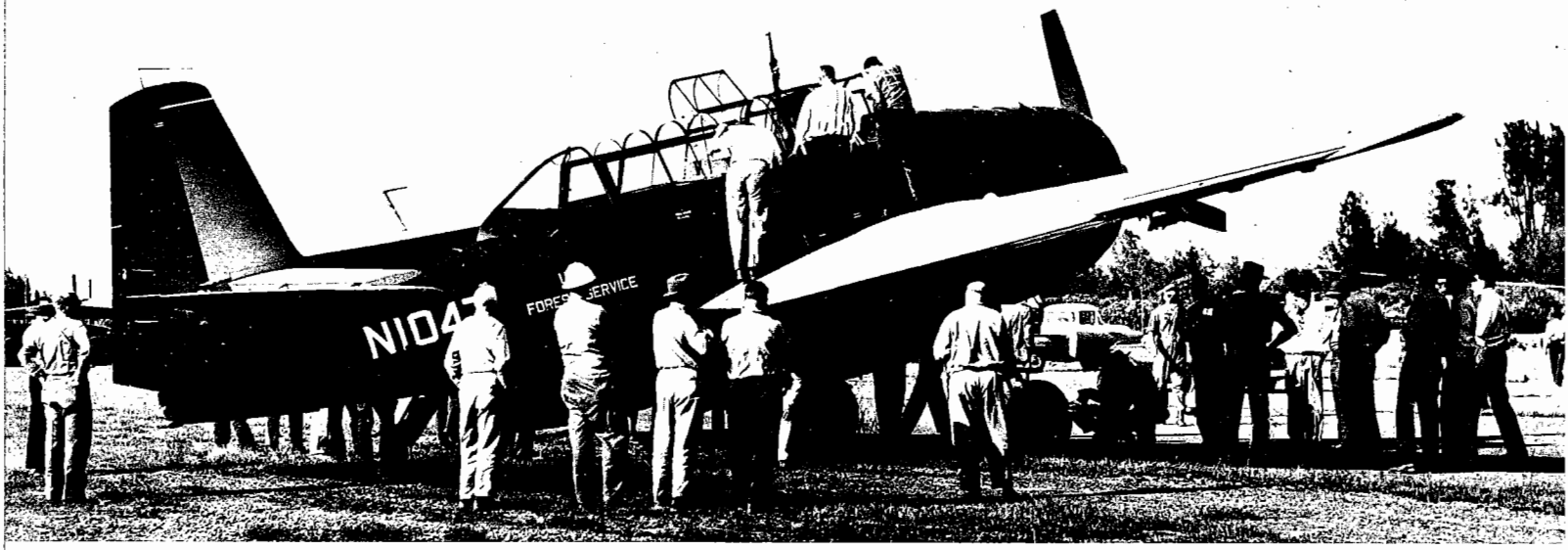
2. DOES RETARDANT WEIGHT AFFECT DROP BEHAVIOR?

3. DO BORATE AND BENTONITE HAVE THE SAME DROP CHARACTERISTICS?

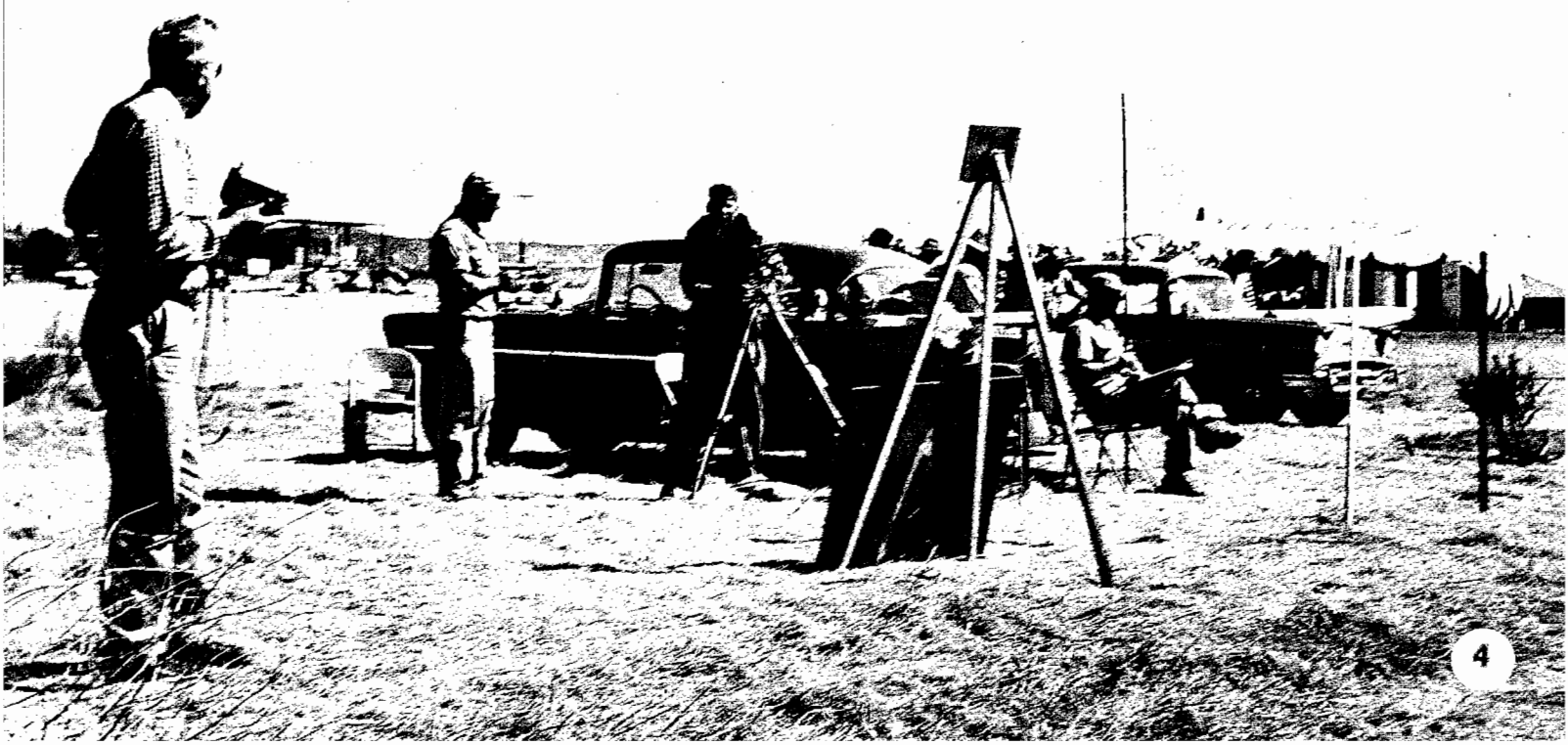
4. HOW DO AIR TANKER HEIGHT AND SPEED AFFECT THE DROP?

5. HOW LARGE SHOULD THE GATE SIZE BE?

6. WHICH IS MORE IMPORTANT--AIR TANKER CARRYING CAPACITY OR MANEUVERABILITY?



TO FIND THE ANSWERS TO THESE QUESTIONS, A NUMBER OF AIR TANKER DROP TESTS HAVE BEEN HELD SINCE 1956. THIS REPORT COVERS TESTS HELD AT THE GLENN COUNTY AIRPORT AT WILLOWS IN 1956, AT SANTA ANA IN 1957 AND AT RAMONA IN 1959.



HOW TESTS WERE MADE

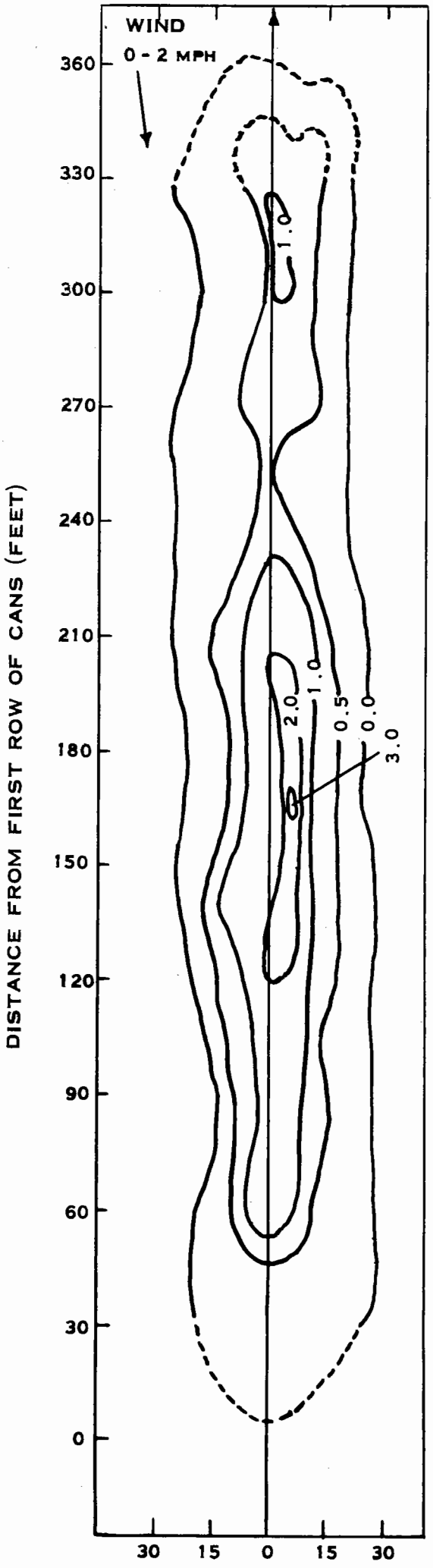
ALL THREE TESTS, WILLOWS, SANTA ANA, AND RAMONA USED BASICALLY THE SAME TEST METHOD; HOWEVER, EACH HAD VARIOUS MODIFICATIONS IN ORDER TO MEET SPECIFIC TEST OBJECTIVES. DROP CONTROL OFFICERS, WORKING AT THE COMMAND POSTS DIRECTED EACH DROP FROM THE GROUND BY RADIO. BY USING TRACKING EQUIPMENT, THEY WERE ABLE TO ADVISE PILOTS OF ERRORS IN SPEED OR ELEVATION AND GIVE THE SIGNAL FOR A DROP OR WAVE OFF.

AT BOTH THE WILLOWS AND SANTA ANA TESTS AIRCRAFT FLEW SINGLY DROPPING THEIR LOADS OVER THE GRID SYSTEM. AT SEVERAL OF THE RAMONA TESTS THE AIRCRAFT FLEW IN TEAMS OF TWO USING MATCHED AIRCRAFT.

THE LEAD PLANE PILOT, ALWAYS IN RADIO CONTACT WITH THE GROUND, GUIDED BY COLORED FLAGS, DROPPED HIS LOAD OVER THE TARGET GRID. THE OTHER MEMBER OF THE TEAM GUIDED BY FLAGS AND CONTROLLING HIS HEIGHT AND SPEED WITH THE LEAD PLANE, DROPPED HIS LOAD SIMULTANEOUSLY. THE CUP GRID SYSTEM WAS LOCATED ONLY IN THE RIGHT-HAND FLIGHT LINE SINCE BY ALTERNATING THE DIFFERENT MATERIALS OVER THE GRID, SUFFICIENT INFORMATION WOULD BE OBTAINED.

THE TESTS ALL USED A GRID COLLECTION SYSTEM CONSISTING OF 119 TO 121 METAL CUP HOLDERS SPECIALLY DESIGNED TO HOLD A STANDARD 10-OUNCE PAPER CUP. THE HOLDERS WERE CONSTRUCTED TO FIRMLY ANCHOR THE CUP IN POSITION AND KEEP IT AT A UNIFORM HEIGHT ABOVE THE GROUND. EACH HOLDER BORE A NUMBER DEFINING ITS POSITION IN THE GRID SYSTEM SO THAT THE CUPS COULD BE NUMBERED AND IDENTIFIED AFTER EACH DROP.

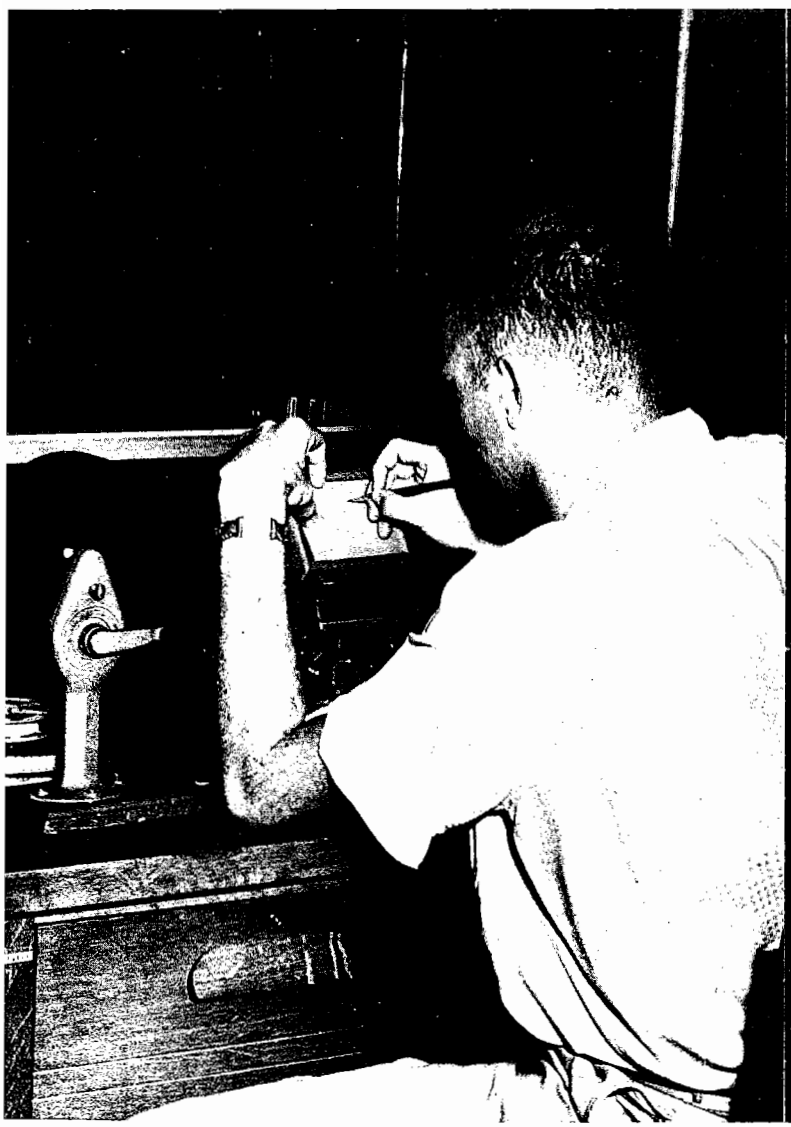
AS DROPS WERE MADE OVER THE GRID SYSTEM THE INDIVIDUAL CUPS WERE COLLECTED, CAPPED TO PREVENT EVAPORATION, AND MARKED WITH THE LOCATION NUMBER. THEY WERE THEN TAKEN TO THE WEIGHING STATION WHERE THEY WERE WEIGHED TO THE NEAREST TENTH OF A GRAM. THE DRY CUP WEIGHT, CORRECTED FOR MOISTURE CONTENT CHANGES, WAS SUBTRACTED AND THE WEIGHT OF ENTRAPPED LIQUID CONVERTED TO GALLONS PER 100 SQUARE FEET. THESE VALUES WERE PLOTTED ON GRAPH PAPER AND CONTOUR LINES CONNECTING POINTS OF EQUAL CONCENTRATION SKETCHED IN.

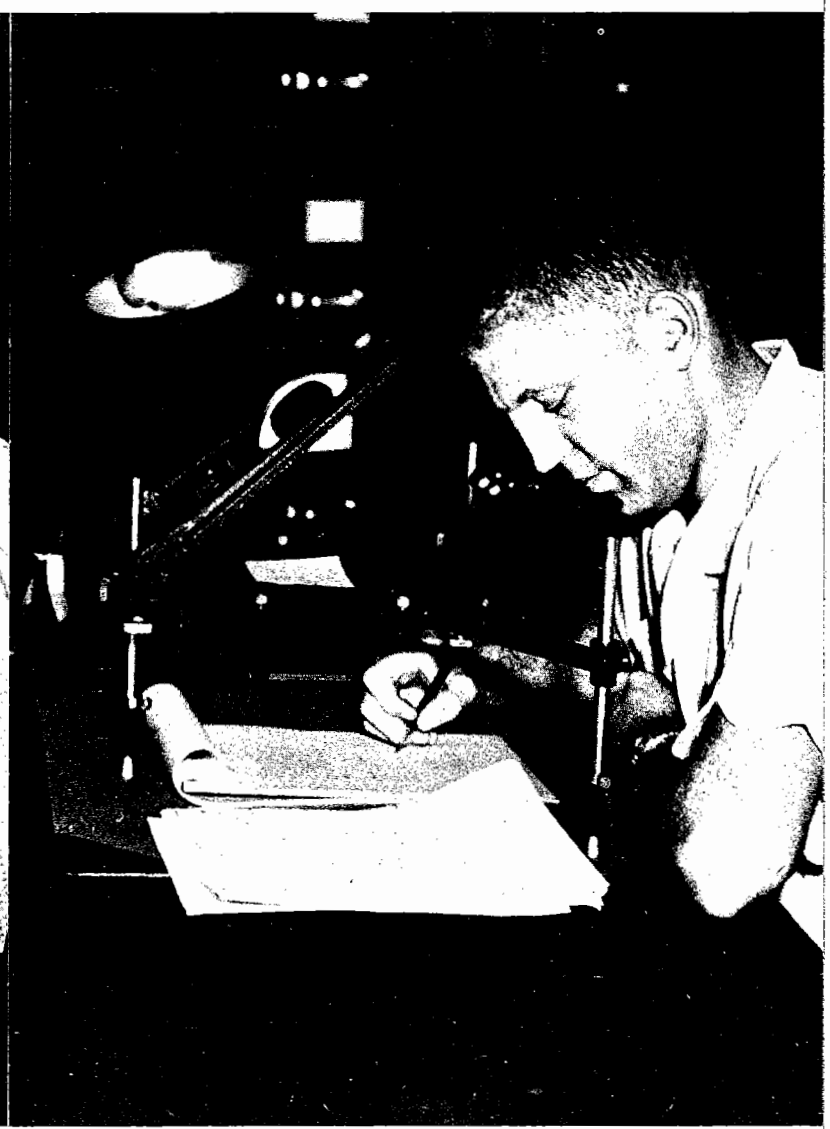

WIND
0 - 2 MPH
360
330
300
270
240
210
180
150
120
90
60
30
0
1.0
2.0
1.0
0.5
0.0
3.0
30
15
0
15
30
DISTANCE FROM FIRST ROW OF CANS (FEET)

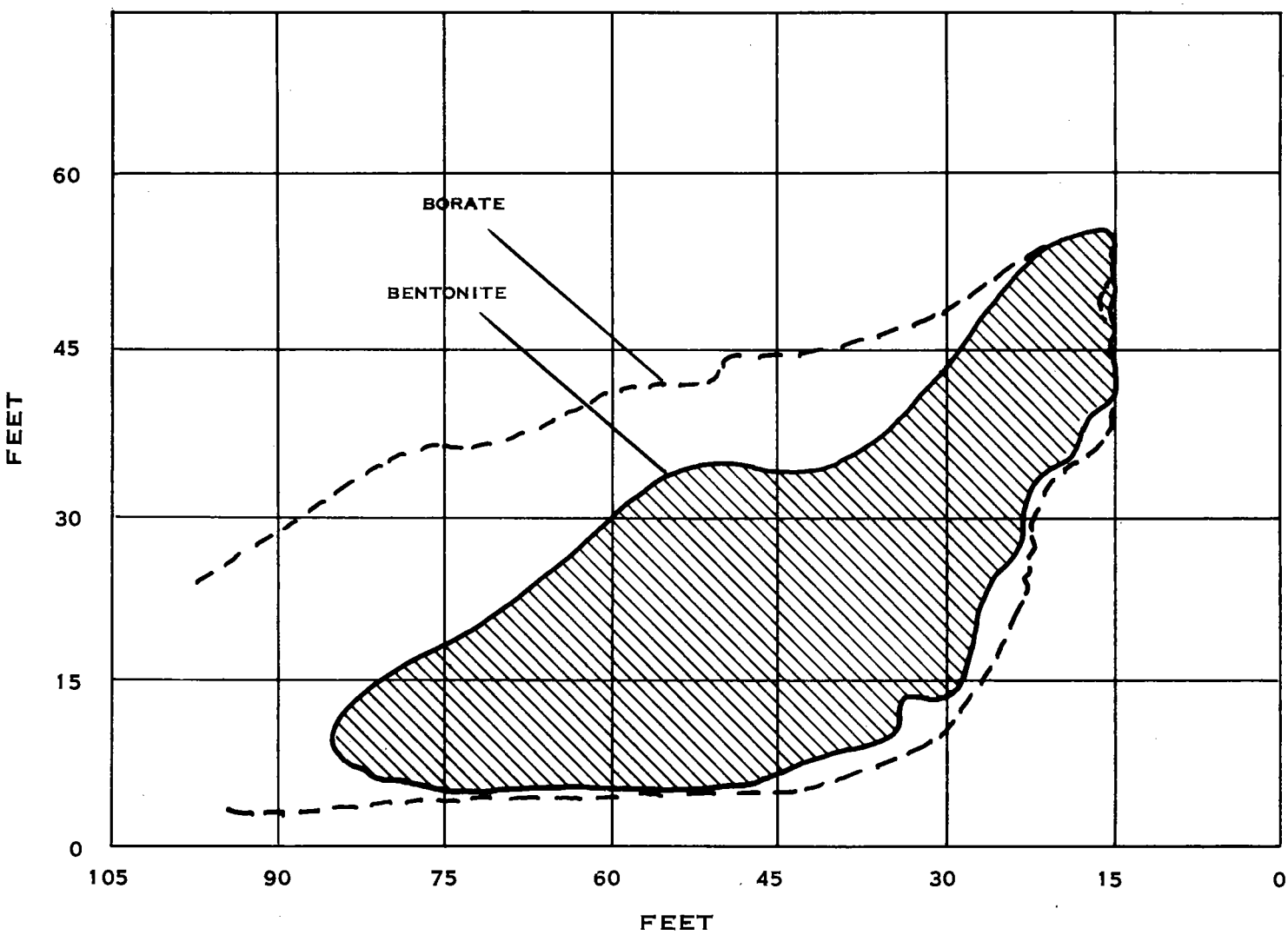
STILL AND MOTION PICTURE PHOTOGRAPHY PLAYED AN IMPORTANT PART IN EVALUATING THE TESTS.

AT WILLOWS SIDE AND END VIEW COLORED MOVIES WERE TAKEN AND THE LINE OF FLIGHT OF THE PLANE IN REFERENCE TO THE TARGET CUPS WAS RECORDED.

AT RAMONA FOUR 16 MM MOTION PICTURE STATIONS WERE ESTABLISHED--TWO AT RIGHT ANGLES TO THE FLIGHT LINES AND ONE EACH AHEAD AND TO THE REAR OF THE GRID SYS-TEM. THE CAMERAS TO THE SIDES AND REAR WERE MOUNTED WITH A FIXED FIELD OF VIEW. THE CAMERAMAN LOCATED AHEAD AND TO THE RIGHT WAS EQUIPPED WITH A ZOOM-ER LENSE. AN ADDITIONAL MOVIE CAMERA WAS USED TO PHOTOGRAPH GENERAL OPERA-TIONS FOR DOCUMENTARY PURPOSES.







TO FIND OUT IF ONE RETARDANT DRIFTED MORE THAN THE OTHERS, FILMS FROM THE TWO PAIRED CAMERA STATIONS AT RAMONA WERE ANALYZED ON PHOTO EDITING EQUIPMENT. FRAMES CORRESPONDING TO EVERY HALF SECOND FOLLOWING THE START OF THE DROP WERE STUDIED, AND TRACINGS WERE MADE OF THE OUTLINE OR PROFILE OF THE DROPPING CLOUD OF RETARDANT. THE TRACINGS TAKEN FROM EACH CAMERA AT IDENTICAL TIMES WERE THEN MATCHED FOR COMPARISON.

A COUNT WAS MADE OF THE NUMBER OF FRAMES FROM THE START OF EACH DROP UNTIL THE RETARDANT FIRST REACHED THE GROUND. SINCE THE CAMERAS RAN AT 24 FRAMES PER SECOND, THE TIME REQUIRED FOR THE DROPPING MATERIAL TO REACH THE GROUND WAS MEASURED.

VISCOSITY REDUCES DRIFT.

PATTERN LENGTH IN FEET

Material	Drop weight	Concentration in gallons per 100 square feet						
		0.5	1.0	2.0	3.0	4.0	5.0	6.0
Water	30	214	170	51	10	5	0	0
Borate	50	207	165	81	22	0	0	0
Borate	50	189	148	96	35	13	5	3
Water	90	202	117	10	0	0	0	0
Borate	100	181	127	33	5	0	0	0

PATTERN AREA IN SQUARE FEET

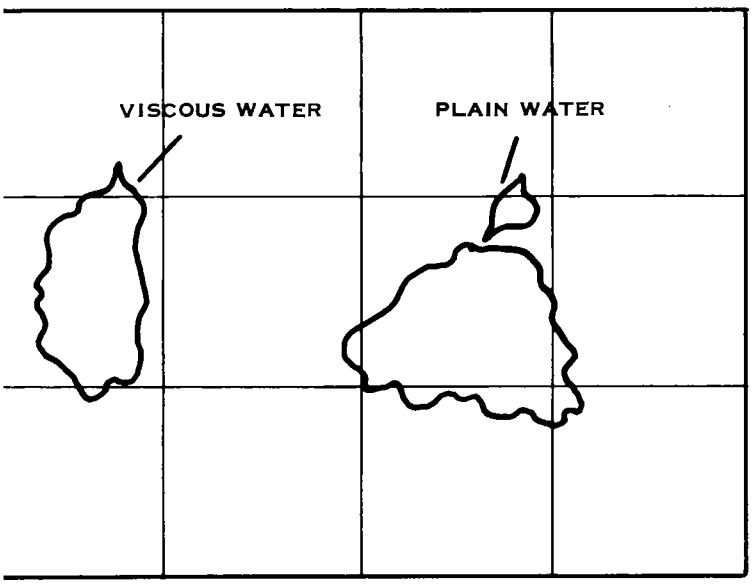
Material	Drop height	Concentration in gallons per 100 square feet						
		0.5	1.0	2.0	3.0	4.0	5.0	6.0
Water	30	5607	3170	283	89	9	0	0
Borate	50	5859	3032	568	75	0	0	0
Borate	50	5677	3292	932	227	65	16	7
Water	90	6530	3100	94	0	0	0	0
Borate	100	6285	2671	142	0	0	0	0

AT WILLOWS REPEATED DROPS WERE MADE OVER THE GRID SYSTEM USING BOTH WATER AND A BORATE SLURRY MIXED AT THE RATE OF FOUR POUNDS PER GALLON. SINCE A PORTION OF BOTH LIQUIDS TEND TO DRIFT THERE WAS NO MATERIAL DIFFERENCE BETWEEN A BORATE SLURRY AND WATER WHEN THE TARGET AREA RECEIVING ONLY 0.5 GALLONS PER 100 SQUARE FEET WAS CONSIDERED.

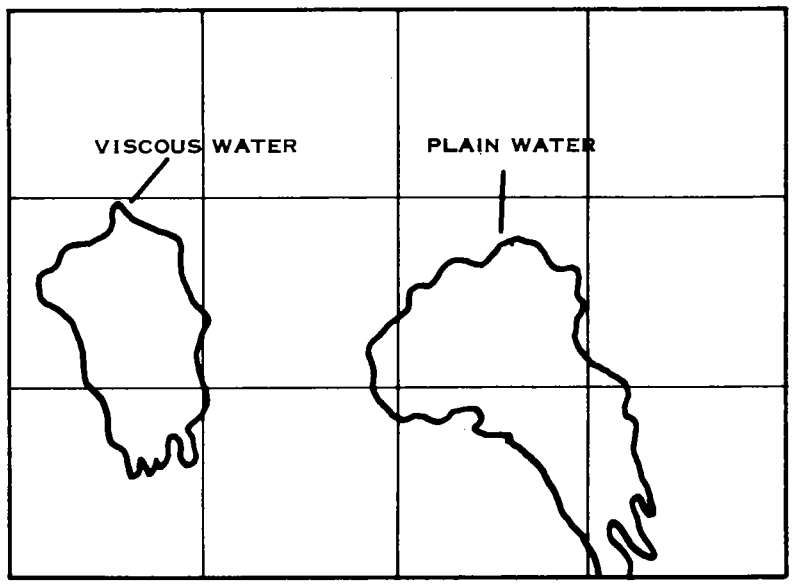
THIS HOLDS TRUE FOR BOTH LENGTH AND SURFACE AREA OF THE DROP PATTERN. HOWEVER, WHEN THE PORTION OF THE TARGET RECEIVING TWO GALLONS OR MORE PER 100 SQUARE FEET WAS CALCULATED--THE MINIMUM REQUIRED TO HOLD A FIRE--WE GET AN ENTIRELY DIFFERENT PICTURE. WHEN DROPPED FROM HEIGHTS IN EXCESS OF FIFTY FEET BORATE EFFECTIVELY COVERED A MUCH LARGER AREA THAN WATER.

AT RAMONA PAIRED DROPS WERE MADE WITH PLAIN WATER AND WATER THICKENED WITH SODIUM CARBOYMETHELCELLULOSE (CMC).

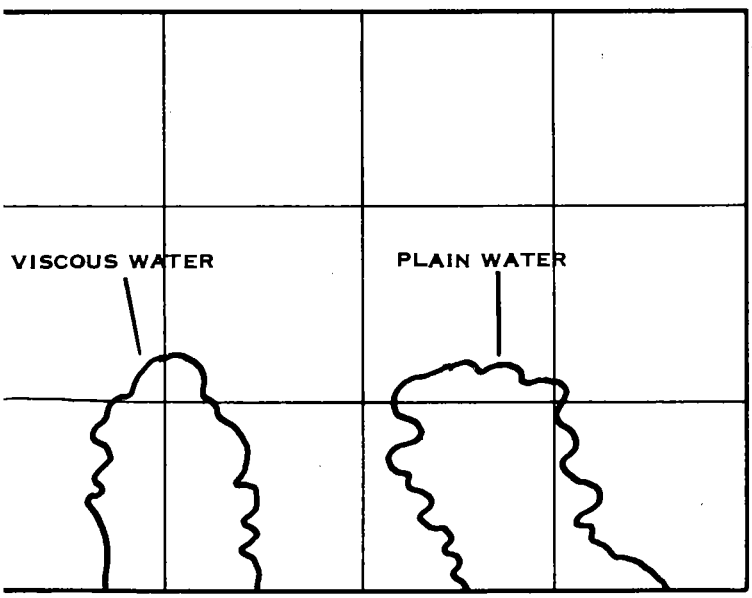
THE MOTION PICTURES OF THE DROPS USING PLAIN AND VISCOUS WATER SHOW THAT ALTHOUGH PLAIN WATER REACHES THE GROUND FIRST, THE VISCOUS WATER DOES NOT DRIFT AS MUCH. AFTER 8 SECONDS ALL OF THE VISCOUS WATER IS ON THE GROUND WHILE THE PLAIN WATER IS STILL DRIFTING OVER THE DROP AREA.



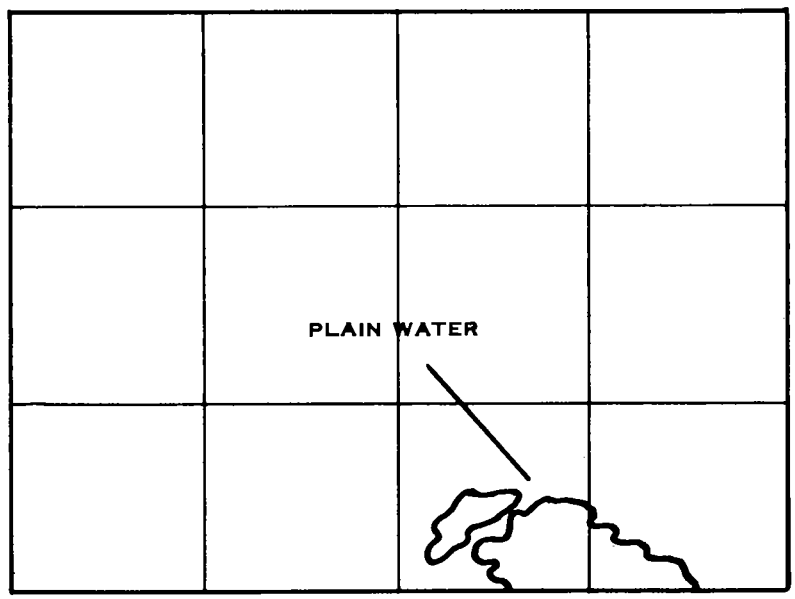
OUTLINE OF FALLING CLOUDS OF VISCOUS WATER (LEFT) AND PLAIN WATER 2 SECONDS FOLLOWING RELEASE AT 89 MPH AND 100 FEET.



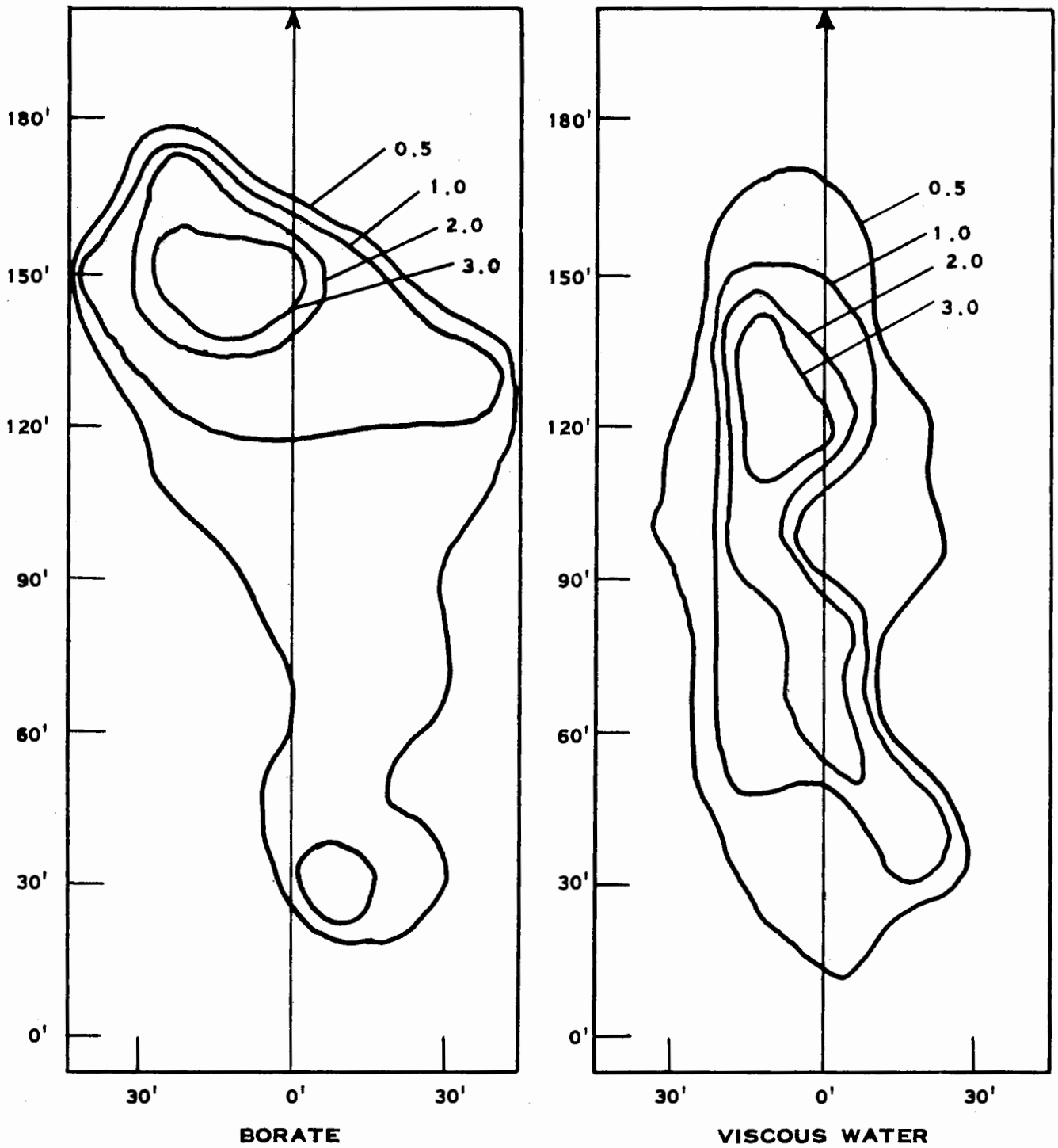
PLAIN WATER HAS REACHED THE GROUND IN 3 SECONDS. ALTHOUGH PLAIN WATER FELL FASTER THAN VISCOUS WATER, IT IS TENDING TO DRIFT MORE.



FOUR SECONDS AFTER RELEASE BOTH PLAIN AND VISCOUS WATER HAVE REACHED THE GROUND.



AFTER 7.5 SECONDS ALL OF THE VISCOUS WATER HAS REACHED THE GROUND WHILE SOME PLAIN WATER IS STILL DRIFTING.



THE DROP PATTERN OBTAINED WITH VISCOUS WATER--EVEN IN HIGH CONCENTRATIONS--SHOWS A SIMILAR PATTERN TO THAT OBTAINED WITH BENTONITE OR BORATE.

REMEMBER, THIS WAS NOT TRUE WHEN PLAIN WATER WAS COMPARED TO BORATE AT THE WILLOWS TEST.

FALL SPEED IS NOT INCREASED BY WEIGHT

DROP TESTS AT WILLOWS SHOWED A MUCH GREATER PORTION OF TARGET COVERED WITH 2 OR MORE GALLONS PER 100 SQUARE FEET WHEN THE DROPS WERE MADE WITH BORATE WEIGHING 10 POUNDS PER GALLON COMPARED TO WATER AT ONLY 8.

AT RAMONA TESTS WERE MADE BY INCREASING THE WEIGHT OF A STANDARD BENTONITE SLURRY BY ADDING BARIUM SULPHIDE (BARIDE). A MATERIAL USED IN THE OIL WELL DRILLING INDUSTRY TO INCREASE THE DENSITY OF BENTONITE DRILLING MUD IN OIL WELLS WITH HIGH GAS PRESSURE.

THE DATA SHOWED A VERY MARKED INCREASE IN THE SIZE OF THE DROP PATTERN THAT RECEIVED CONCENTRATIONS IN EXCESS OF 2 GALLONS OR MORE PER 100 SQUARE FEET AS THE SLURRY WEIGHT WAS INCREASED FROM 8.88 TO 9.95 POUNDS.

HOWEVER, A SIMILAR INCREASE IN EFFECTIVENESS WAS SHOWN AT RAMONA WITH VERMICULITE. THIS MIXTURE, REPORTEDLY ABLE TO INCREASE THE WATER HOLDING CAPACITY OF BENTONITE WEIGHED ONLY 8.86 POUNDS PER GALLON--LESS THAN THE OTHER TWO.

BOTH THE BARIDE AND THE VERMICULITE WERE MIXED IN SMALL BATCHES USING A CANVAS TANK AS A RESERVOIR. NO RECORD WAS KEPT OF THEIR VISCOSITIES. IT MAY BE THAT A HIGHER VISCOSITY RATHER THAN A HIGHER WEIGHT IS RESPONSIBLE FOR THE DIFFERENCE.

SIMILARLY THE BORATE SLURRY USED AT WILLOWS HAD A HIGHER VISCOSITY THAN THE WATER. THIS FACTOR RATHER THAN WEIGHT MAY HAVE BEEN LARGELY RESPONSIBLE FOR THE DIFFERENCE IN TARGET PATTERNS.

WEIGHT APPARENTLY MAKES NO DIFFERENCE IN THE SPEED OF FALL OR DRIFT.

N3N 180 GALLONS

Height (feet)	Speed (mph)	Weight (gal./lb.)	Chemical	Area 2 gal. 100 sq. ft. (100 ft.^{2})
50	75	8.88	BENTONITE	17.0
50	84	8.88	BENTONITE	17.6
60	81	8.86	BENTONITE + VERMICULITE	33.4
90	63	9.26	BORATE	24.2
100	71	8.86	BENTONITE + VERMICULITE	28.4
100	71	9.95	BENTONITE + BARIDE	27.8
100	84	9.26	BORATE	10.3
140	69	9.95	BENTONITE + BARIDE	24.8

F7F 800 GALLONS

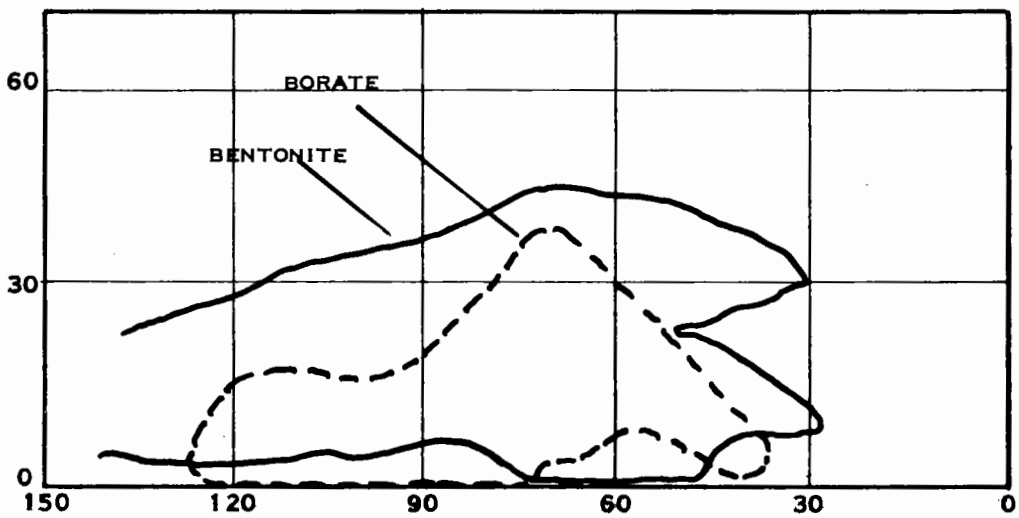
Height (feet)	Speed (mph)	Weight (gal./lb.)	Chemical	Area 2 Gal. 100 sq. ft. (100 ft.^{2})
50	95	8.88	BENTONITE	68.4
50	135	9.26	BORATE	9.8
100	95	9.26	BORATE	2.7
100	124	8.88	BENTONITE	4.5
145	124	9.26	BORATE	13.2

BORATE AND BENTONITE DROP ALIKE

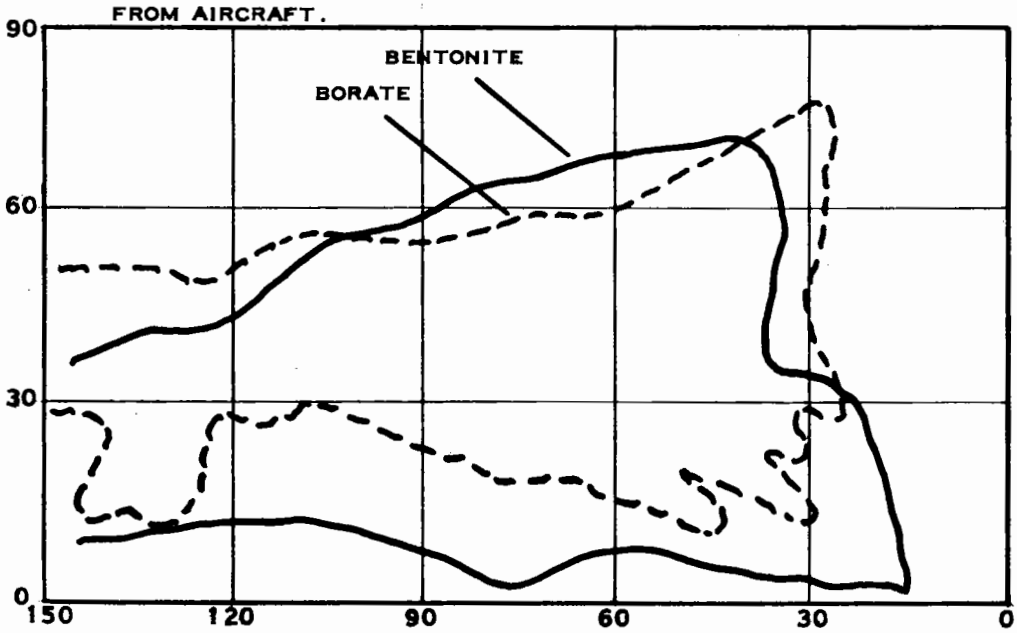
THE MOTION PICTURE RECORD SHOWS THAT THERE WAS NO MATERIAL DIFFERENCE IN THE SPEED WITH WHICH BENTONITE AND BORATE FALLS.

THERE WAS NO SIGNIFICANT DIFFERENCE IN THE AMOUNT OF DRIFT BETWEEN BENTONITE AND BORATE.

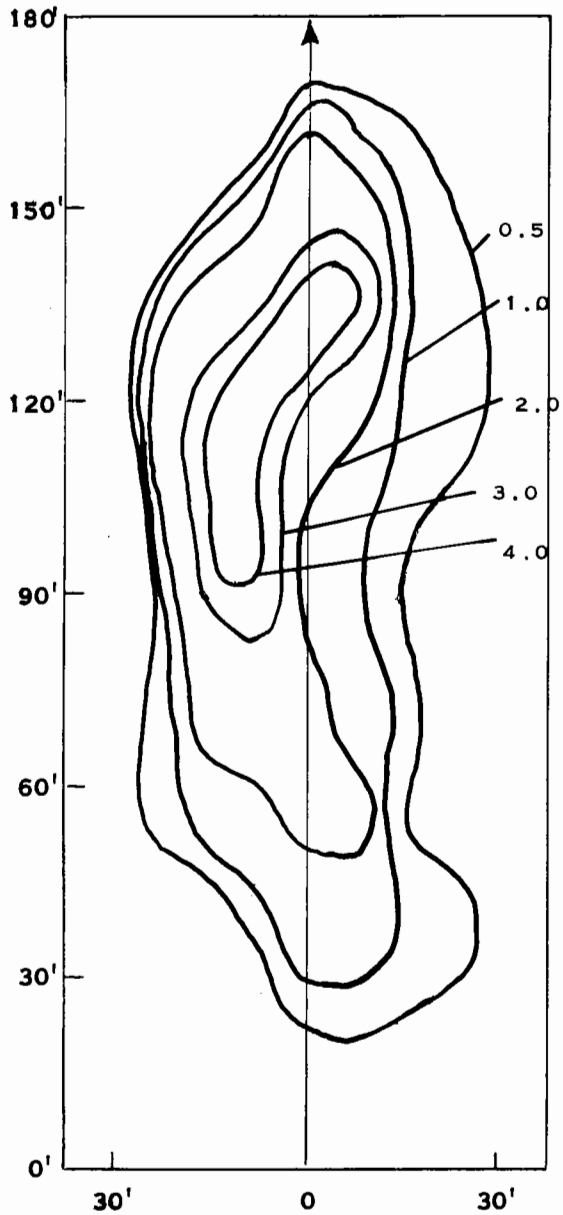
THE SIZE OF THE AIR TANKER OR THE VOLUME OF RETARDANT DROPPED DID NOT CAUSE ANY DIFFERENCE IN THE COMPARATIVE BEHAVIOR OF BENTONITE OR BORATE WHILE DROPPING THROUGH THE AIR.



LOW SPEED AND HIGH ELEVATION 2 SECONDS AFTER RELEASE FROM AIRCRAFT.

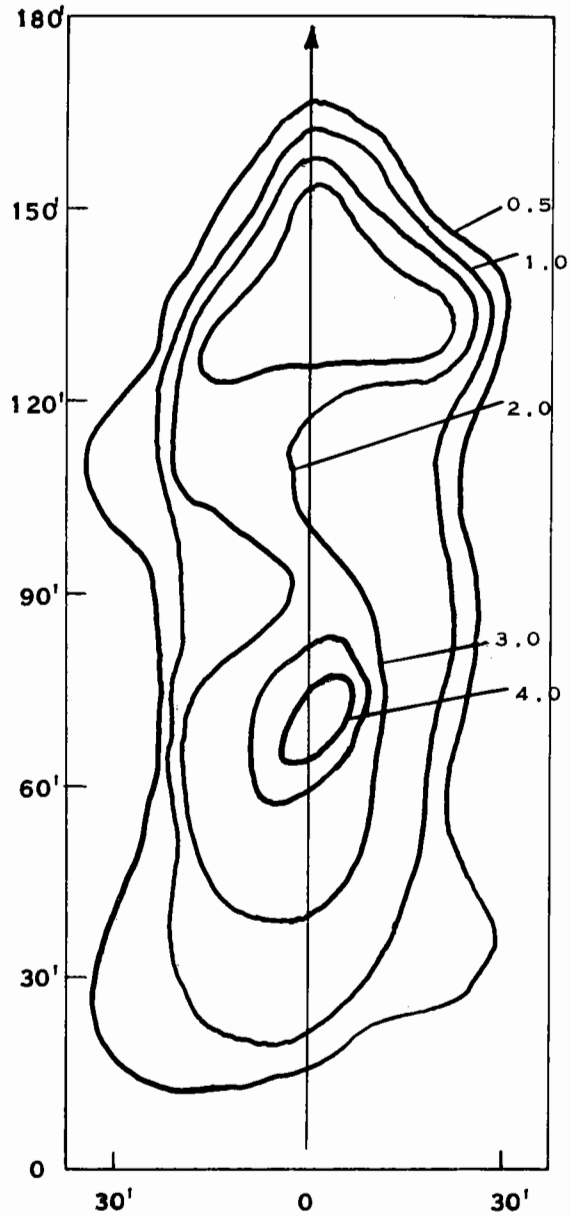


MODERATE SPEED AND HIGH ELEVATION 2.5 SECONDS AFTER RELEASE.



BORATE

9.26 POUNDS/GALLON



BENTONITE AND VERMICULITE

8.86 POUNDS/GALLON

AN ANALYSIS OF DATA COLLECTED AT RAMONA SHOWS THAT THERE IS NO MATERIAL DIFFERENCE BETWEEN THE EFFECTIVE GROUND PATTERN OF WELL-MIXED BORATE AND BENTONITE DROPPED UNDER SIMILAR CONDITIONS.

DRIFT INCREASES WITH BOTH HEIGHT AND SPEED

EFFECT OF DROP HEIGHT AT WILLOWS

Air speed (mph)	Height (feet)	Retardant	Quantity (gallons)	Ground pattern 2 or more gallons/100 sq. ft.	
				Length	Area (sq. ft.)
80	25	BORATE	100	93	553
80	50	BORATE	100	95	915
80	100	BORATE	100	33	142
80	200	BORATE	100	0	0

ALL 3 TESTS SHOWED THAT INCREASED HEIGHT AND SPEED HAD AN ADVERSE EFFECT ON THE DROP PATTERN.

DIVE BOMBING AND STEEP BANKING TURNS WERE FOUND TO BE INEFFECTUAL AT THE WILLOWS TEST.

DIVE BOMBING GAVE PATTERNS THAT WERE LONGER AND LESS CONCENTRATED THAN LEVEL FLIGHT PATTERNS. ALTHOUGH DISCHARGE TIME WAS SHORTER IT WAS OFFSET BY THE UNAVOIDABLE INCREASE IN AIR SPEED DUE TO THE DIVE.

THE WILLOWS DATA SHOWED THAT AS THE DROP ELEVATION INCREASED ABOVE 50 FEET THE AREA RECEIVING 2 GALLONS OF RETARDANT PER 100 SQUARE FEET DECREASED MARKEDLY.

MOTION PICTURE ANALYSIS OF THE TIME REQUIRED FOR THE RETARDANT TO REACH THE GROUND SHOWED THAT HEIGHT IS MORE IMPORTANT THAN SLURRY WEIGHT IN DETERMINING RETARDANT DRIFT. NOT ONLY DID INCREASED HEIGHT SUBJECT THE RETARDANT TO MORE EVAPORATION AND WIND DRIFT BUT ALSO THE AIR TURBULENCE REDUCED ITS VISCOSITY.

INFORMATION OBTAINED AT RAMONA GIVES THE SAME BASIC RESULTS. BOTH 180-GALLON DROPS FROM THE N3N's AND THE 800-GALLON DROPS FROM THE F7F's SHOWED A DECLINE IN EFFECTIVE AREA AND LENGTH OF PATTERN.

DATA FROM RAMONA SHOW THAT AS SPEED INCREASES NOT ONLY WAS THE EFFECTIVE AREA REDUCED IN SIZE AND LENGTH BUT THERE WAS A TENDENCY TO MISS THE TARGET.

MOTION PICTURE ANALYSES SHOW THAT AS SPEED AND ELEVATION INCREASE BOTH BORATE AND BENTONITE BREAK UP INTO LARGE CLOUDS THAT TEND TO DRIFT AWAY FROM THE TARGET.

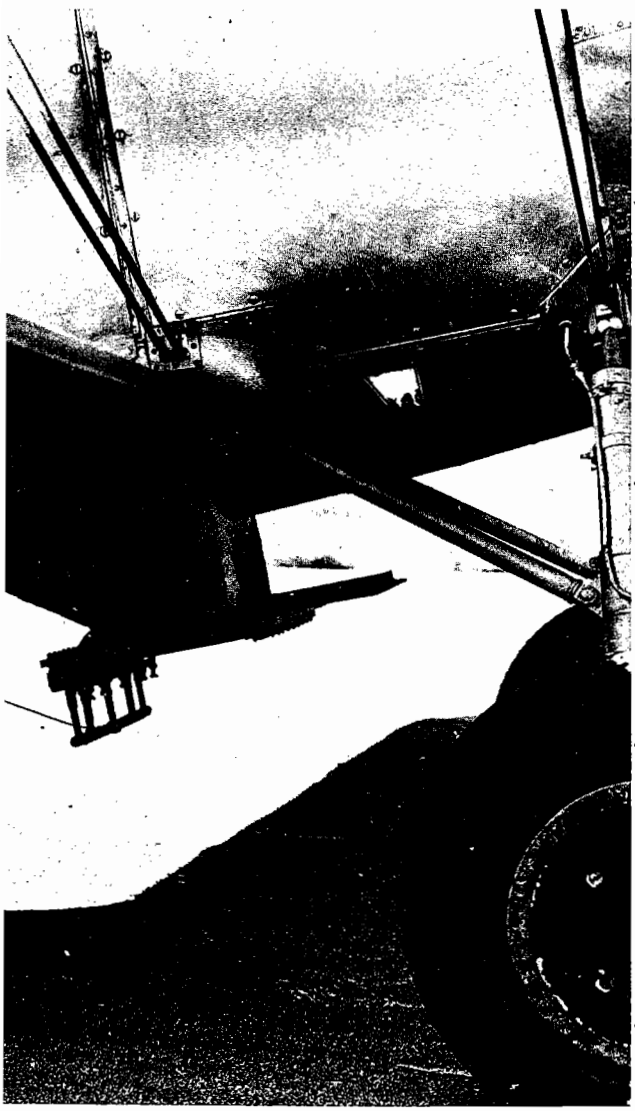
EFFECT OF DROP HEIGHT AND SPEED AT RAMONA

Speed (mph)	Height (feet)	Retardant	Quantity (gallons)	Length (feet)	Ground pattern 2 or more gallons/100 square feet area (sq. ft.)
96	50	BENTONITE	180	82	1760
96	100	BORATE	180	45	1030
109	50	BENTONITE	800	150	6840
109	100	BORATE	800	28	270
72	90	BORATE	180	114	2420
96	100	BORATE	180	45	1030
109	50	BENTONITE	800	150	6840
156	50	BENTONITE	800	52	980

BIG GATES GIVE BETTER DROPS

IT DIDN'T TAKE PILOTS AND FIRE CONTROL PEOPLE LONG TO COME TO THE CONCLUSION THAT AGRICULTURAL SPRAY EQUIPMENT WOULD NOT RELEASE RETARDANTS FAST ENOUGH TO GIVE SUFFICIENT COVERAGE ON THE GROUND TO STOP FIRES.

AT WILLOWS, TESTS WERE MADE USING GATES OF 115 AND 175 SQUARE INCHES ON THE BOTTOM OF 100 GALLON RETARDANT TANKS. IT WAS FOUND THAT THE OVERALL PATTERN WAS LONGER FOR THE SMALLER GATE. HOWEVER THE EFFECTIVE PATTERN (2 GALLONS PER 100 SQUARE FEET OR MORE) WAS MUCH SMALLER. THE SMALL GATE GAVE NO CONCENTRATIONS GREATER THAN 3 GALLONS PER 100 SQUARE FEET WHEN DROPPED FROM 50 FEET WHILE THE LARGE GATE GAVE CONCENTRATIONS AS HIGH AS SIX GALLONS.



SIZE OF AREA RECEIVING CONCENTRATION OF BORATE IN EXCESS OF 0.5 GALLONS/100 SQUARE FEET

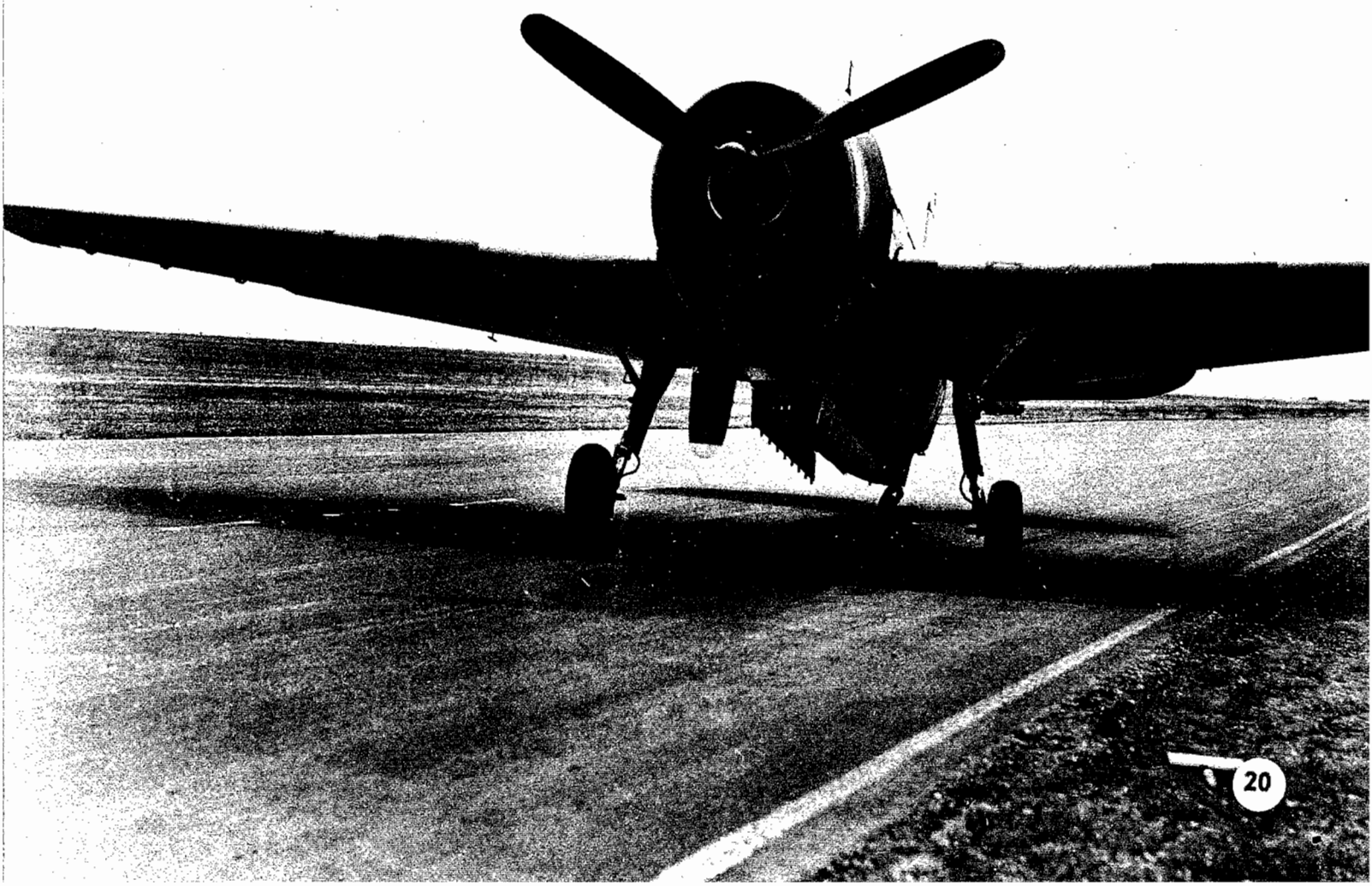
Drop height (feet)	Small gate square feet	Large gate square feet
25	5859	4696
50	5389	5677
100	5629	6285
200	4575	6416

SIZE OF AREA RECEIVING CONCENTRATION OF BORATE IN EXCESS OF 2.0 GALLONS/100 SQUARE FEET

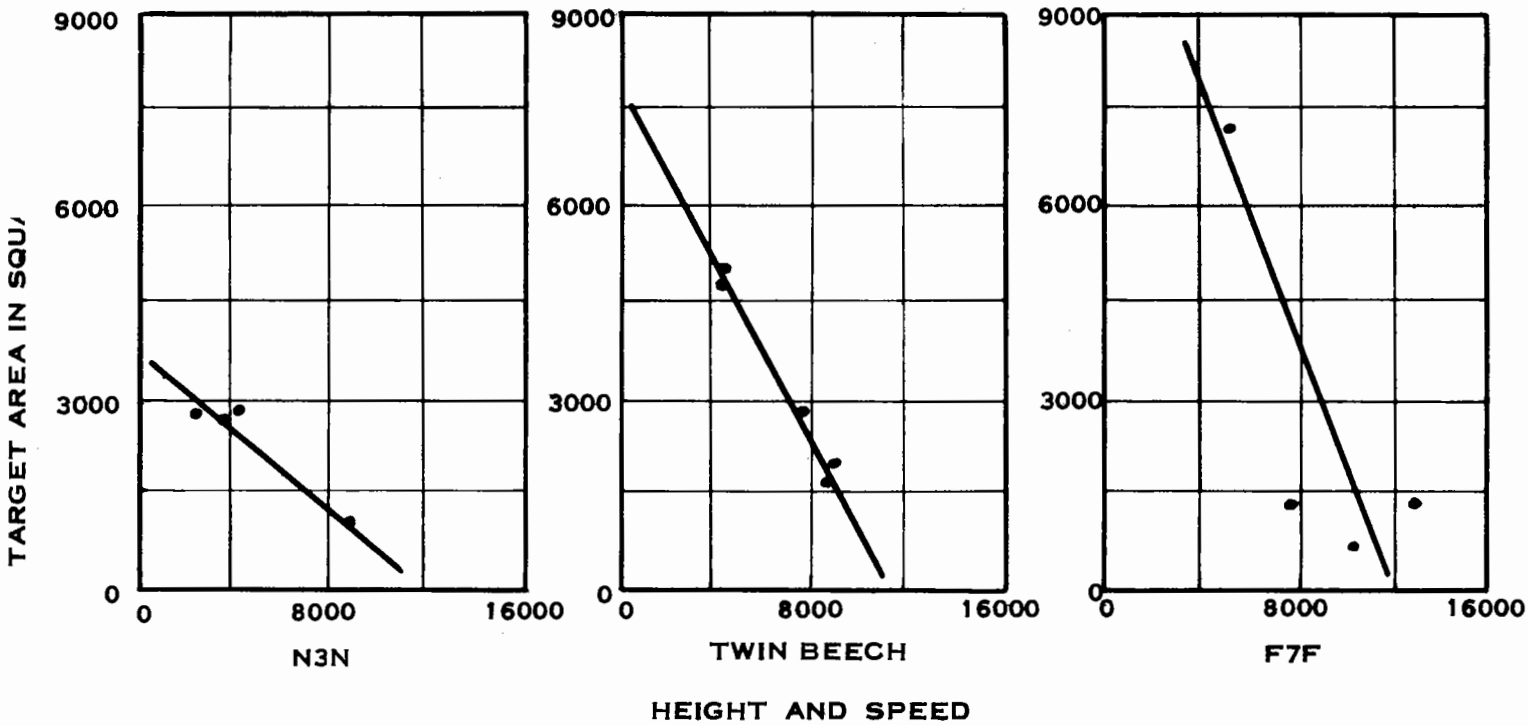
Drop height (feet)	Small gate square feet	Large gate square feet
25	568	553
50	352	915
100	0	0
200	0	0

AT THE SANTA ANA TESTS TANK CAPACITIES HAD INCREASED TO 1,500 GALLONS AND GATES HAD JUMPED TO 2,000 SQUARE INCHES IN AREA--IN EFFECT DROPPING THE BOTTOM OF THE TANK. THE DOORS ON THE TBMs AND PBY STUDIED IN THESE TESTS USED HYDRAULIC OR ELECTRIC SYSTEMS TO CONTROL THE RELEASE OF THE LIQUID AND WERE ABLE TO DROP ALL OR PART OF IT DEPENDING ON THE WISHES OF THE PILOT.

FROM THE STUDY OF THE PATTERNS IT APPEARS THAT GATE OPENINGS OF 1,000 SQUARE INCHES FOR EACH 200-250 GALLONS WOULD BE OPTIMUM FOR GOOD CLEAN DROPS. PROPER VENTING OF TANKS ALSO HELPS.



LARGE CARRYING CAPACITY VS MANUEVERABILITY DEPENDS ON THE FIRE SITUATION



WHEN THE SIZE OF THE AREA RECEIVING EFFECTIVE COVERAGE IS PLOTTED ON A GRAPH AS A FUNCTION OF THE PRODUCT OF SPEED AND HEIGHT THE RESULT IS A SCATTER DIAGRAM SHOWING AN INVERSE RELATIONSHIP OF AREA TO HEIGHT AND SPEED. EACH TYPE OF AIRCRAFT SHOWS A SLIGHTLY DIFFERENT TREND.

A COMPARISON OF THESE CURVES SHOW THAT FOR A GIVEN COMBINATION OF HEIGHT AND SPEED THE LARGER THE LOAD THE LARGER WILL BE THE EFFECTIVE DROP PATTERN. HOWEVER, THE GRAPHS ALSO SHOW THAT A LARGE LOAD DROPPED HIGH AND FAST MAY NOT BE AS EFFECTIVE AS A SMALL LOAD DROPPED AT A COMBINATION OF LOW HEIGHT AND SPEED.

IN OTHER WORDS, FLYING CONDITIONS PERMITTING, A BIG CAPACITY AIRPLANE FLYING LOW AND SLOW WILL DO MORE EFFECTIVE WORK THAN A SMALL PLANE. HOWEVER, IF STALL SPEED OR TERRAIN FORCE A LARGE PLANE TO FLY HIGH AND FAST, IT MAY NOT DO AS WELL AS A SMALL MORE MANEUVERABLE AIR TANKER.

CONCLUSIONS TO DATE:

1. VISCOSITY REDUCES DRIFT
2. FALL SPEED IS NOT INCREASED BY WEIGHT
3. BORATE AND BENTONITE FALL ALIKE
4. DRIFT INCREASES WITH BOTH HEIGHT AND SPEED
5. BIG GATES GIVE BETTER DROPS
6. LARGE CARRYING CAPACITY VS MANEUVERABILITY DEPENDS ON THE FIRE SITUATION

THE CALIFORNIA AIR ATTACK COORDINATING COMMITTEE REPRESENTS THE FOLLOWING AGENCIES:

STATE OF CALIFORNIA DIVISION OF FORESTRY

LOS ANGELES COUNTY FIRE DEPARTMENT

FOREST SERVICE, U. S. DEPARTMENT OF AGRICULTURE
PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION
ARCADIA EQUIPMENT DEVELOPMENT CENTER
REGION 5

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COVER: F7F AIRTANKERS MAKING TEST DROPS AT RAMONA AIRPORT, OCTOBER 1959

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