MOUNT WASHINGTON OBSERVATORY

GORHAM, NEW HAMPSHIRE

2 Divinity Avenue
Cambridge 38, Mass.
November 8, 1948

Dr. Vincent J. Schaefer
Research Laboratory
General Electric Company
Schenectady, New York

Dear Vince:

The following has been reported by Robert B. Smith and James L. Rosenberry as a summary of the work done at the Mount Washington Observatory, for the General Electric Company, during October, 1948.

In October, 1948, the cloud data observations at both above and below freezing temperatures were made on a routine basis except for slight interruptions due to observers being engaged in laying a new floor in the Observatory. The summary of icing observations for October is enclosed.

Sublimation nuclei counts were made on a routine basis. On October 26th Dr. Schaefer visited the summit and installed a new motor and blower in the nuclei counting chamber. The circulation of the air into the chamber was changed so that air is now drawn out of the chamber by the blower rather than being forced into it. This change was made with the two-fold purpose of preventing fragile frosts from collecting on the top of the chamber and possibly being broken or scattered about by the turbulent blast from the blower, and to eliminate or minimize the amount of snow sucked into the chamber or stirred up from its bottom. No effect of this change of procedure on the nuclei counts has been observed so far. The nuclei observation data sheets are enclosed.

Photocell observations of the light intensity in relationship to cloud cover were continued on a routine basis. Mr. Falconer, visiting the summit on October 26th with Dr. Schaefer, changed the arrangement of the light for the night photocell. Both the light and the photocell are now housed in the same box which is about 15" on the side. The photocell "looks" outward along the beam from the spotlight so as to indicate the amount of light scattered or reflected backward from the beam, which is hoped to be found related to the density of fog in the beam. So far, the photocell has not been sensitive enough to differentiate between fog and clear-air conditions. Since it is unlikely that

[11/8/48]

the intensity of the light can be greatly increased, it is suggested that a more sensitive photocell be obtained or that its indication be amplified.

Dr. Schaefer brought up a pair of wire screens, and a photographic outfit which will be used for experiments on the effect of dry ice on the icing rate in clouds. An exposure site for these experiments has been set-up between the Observatory building and the Yankee Network building, where an exposure stand, a floodlight, and a wooden shield to shelter the observers, have been installed. The photographic equipment has been set up in the basement of the Observatory, where the prefocused camera is expected to yield better quality photographs than were obtained last year. Sets of nozzles of different sizes for use in dry ice experiments were also brought up. Mr. Dickey, the engineer in charge of the Navy Aeronautical Engine Laboratory's experiments at Mt. Washington, will make the fittings to be used with these nozzles.

Thirty-seven additional tanks of CO_2 were delivered, bringing the total supply to 50 tanks of 50 lb. capacity each. The tanks recently delivered were received without caps, and one tank was found empty on delivery. Caps have been ordered.

Mr. Smith, who left the summit late in September to undergo an operation, returned on October 9, but his condition still did not permit him to undertake strenuous duties. When Mr. Rosenberry left for his regular time off on October 14, the three weather Bureau observers cooperated by taking several cloud data observations a day, when conditions permitted. However, the coverage of fog and icing conditions was below normal, especially during one icing period when work on the new floor was underway.

Sincerely,

Wallace E. Howell

Wallace E. Howell
Acting Director

WEH:w

encs.

[11/8/48?]

MOUNT WASHINGTON OBSERVATORY
October Icing Summary

28 runs
19 fog - 9 icing

	L_w	Temp. °C	Kø	Wind m/s	D_d microns
19 fog	0.81	+4.2	198	14.0	15.7
9 icing	0.37	-2.8	181	15.4	13.6
28 avg.	0.67	+2.0	193	14.4	15.0

Drop Size Distribution

	A	B	C	D	Total
19 fog	13	4		2	19
9 icing	7	2			9
28 total	20	6		2	28

	h_c (meters)	exposure time (secs.)	x_v
19 fog	340	21.8	6.57
9 icing	249	1633	3.89
28 avg.	311	-	5.72

	Rg	Ri	ei	Snow xTal Size
9 icing	2.93	0.86	0.75	1.20

Pressure

	Mean	Max.	Min.
19 fog	804.9	808.8	800.1
9 icing	798.2	809.0	794.5
28 avg.	802.8		

MOUNT WASHINGTON OBSERVATORY

GORHAM, NEW HAMPSHIRE

2 Divinity Avenue
Cambridge 38, Mass.
December 15, 1948

Dr. Vincent J. Schaefer
Research Laboratory
General Electric Company
Schenectady, New York

Dear Vince:

The following has been reported by Robert B. Smith as a summary of the work done at the Mount Washington Observatory, for the General Electric Co., during November, 1948.

The work carried on for the General Electric Co. at the Mount Washington Observatory during November, 1948, included routine sublimation nuclei counts, routine day and night photocell records, routine radio contacts with the Research Laboratory in Schenectady, and preliminary wire screen and nozzle tests.

The change in procedure in the sublimation nuclei counts initiated in October has proven satisfactory. Frost formation on the black felt in the cold chamber has been practically eliminated by placing the felt further from the chamber walls, as recommended by Dr. Schaefer.

There has been very little trouble in obtaining day photocell records of sky brightness. However, the night photocell is still too insensitive to give any useful record. Aeronautical Ice Research Laboratory has a setup on the roof of Tip Top House which works fairly well, except that the components ice up. The light source is a six volt spotlight, which has a surprisingly directional beam. The photocell

[12/15/48]

recorder is a G. E. model with fullscale sensitivity of 10 microamps. The sensitivity is sufficient to show fluctuations in fog intensity, though not too much correlation with liquid water content has been obtained as yet. The distance between light source and photocell pickup is about 25 feet.

The routine radio contacts were useful for exchanging weather data and news.

The brass nozzles for use with the dry ice tests have given much trouble. At first, the copper tubing used was unsatisfactory, being too small, and badly bent. When it was replaced with 1/8th pipe, the largest nozzle - .030" did not clog up. As yet the smallest nozzle has not worked. Possibly impurities in the carbon dioxide are a source of trouble.

Because of the trouble with nozzles, only one wire screen run has been made so far. The reduction in icing was most noticeable on the smallest wires.

The CO_2 comes out of the largest nozzle in such a cloud that the nozzle can be used only with very strong winds.

The films have not been developed yet, but the photographic arrangements seem satisfactory.

Future work will be mainly to get the nozzles working and then to obtain data on the wire screens, preparatory to making the tests in the jet engines in January or February. To measure the effectiveness of the dry ice in the duct of the jet, Dr. Howell has proposed the use of tapered cones. Drop size would be determined by measuring the diameter of cone at which the diameter of the ice equalled that of the cone. Experiments have been undertaken to ascertain the validity of this method.

Sincerely,

Wallace E. Howell

Wallace E. Howell
Director

encs.

WEH:w

MOUNT WASHINGTON OBSERVATORY

GORHAM, NEW HAMPSHIRE

January 6, 1949

Dr. Vincent J. Schaefer
Research Laboratory
General Electric Co.
Schenectady 5, New York

Dear Vince:

The following has been reported by Mr. R. B. Smith as a summary of the work done at the Mount Washington Observatory for the General Electric Company during December 1948.

The work included routine sublimination nuclei counts, routine day photocell records, routine radio contacts with the Research Laboratory in Schenectady, and wire screen and nozzle tests.

For the first few days in December, the sublimation nuclei observations were not taken on a routine basis, the new personnel believing the observations were to be taken only during periods of icing. At times, from the 27th to the 29th, the nuclei counts changed greatly from one observation to another. These fluctuations were apparently real.

The day photocell records were obtained on a routine basis, with no startling results apparent. The night photocell records were suspended when water penetrated the photocell and rendered it insensitive. When a waterproof cell is obtained, probably during January, 1949, the night photocell records will be resumed. If the night photocell trace continues to show no deflection, a zero to fifty microamp meter will be put in the circuit to give visual indication of whether the photocell deflection changes between fog and non-fog conditions. Possibly varying liquid water content would be indicated also. A meter with full scale deflection of 20 microamps would be preferable.

The photoelectric recorder optical system light burned out and had to be replaced.

C1/6/49

A vaned brass cone tapering from a diameter of about a half inch to a point in about 5⅛ inches has been exposed for over fifty tests. The data obtained so far has not demonstrated the practicability of the use of tapered cones to obtain mean effective droplet size in the jet engine duct.

The dry ice nozzles are still unsatisfactory, plugging usually occurring before sufficient ice has collected on the wire screens. All the tests made to date are listed in the separate enclosure.

In order to raise nozzle temperature above the triple point of CO_2, a finned nozzle was made. A regular .030 nozzle was slotted and three copper fins, equally spaced, were soldered into the slots. The fins are about 1/32 inch thick and 2 inches long. Their width increases from about 5/8 inch at the nozzle to 1-1/8 inch at the outer edge. In its first two tests the nozzle worked perfectly, but it has not worked successfully since.

More tests are needed to determine whether the finned nozzle will work. If it does not, the next step will be to use a cotton filter to absorb the impurities in the CO_2. If the nozzle still fails to work, it may be necessary to shorten the pipe from the CO_2 bottle to the nozzle (now twelve feet), to change the shape of the bore of the nozzle, or to heat the nozzle.

Sincerely,

Wallace E. Howell
Director

encs.

WEH:w

MOUNT WASHINGTON OBSERVATORY

GORHAM, NEW HAMPSHIRE

January 18, 1949

Dr. Vincent J. Schaefer
Research Laboratory
General Electric Company
Schenectady 5, New York

Dear Vince:

Enclosed are two sets of photographs of the screen collector on Mount Washington. The first set was apparently made to find out the exposure necessary for the camera, etc., and I do not have any data on the conditions of exposure of the screen. The pictures of the second set are identified by the appropriate letter, and the data are those already sent you.

After inspecting these negatives, I am recommending that negative #3 of the first set be used as an exposure guide. Bob Smith reports that the focus position will be rechecked, since some of the photos are definitely out of focus. Vibration still appears something of a problem (run A, 3rd exposure) but he will check on that also.

Sincerely,

Wallace E. Howell

Wallace E. Howell

encs.

WEH:w

MOUNT WASHINGTON OBSERVATORY

GORHAM, NEW HAMPSHIRE

2 Divinity Avenue
Cambridge 38, Mass.
February 7, 1949

Dr. Vincent J. Schaefer
Research Laboratory
General Electric Company
Schenectady 5, New York

Dear Vince:

The following has been reported by Mr. R. B. Smith as a summary of the work done at the Mount Washington Observatory for the General Electric Company during January 1949.

"The work included routine sublimation nuclei counts, routine radio contacts with the Research Laboratory in Schenectady, routine time-marking of photocell records, routine vaned, tapered cone data, and many special projects. The special work included testing of an antice compound on the model airplane propeller, extra sublimation nuclei counts when the G. E. silver iodide generator was producing nuclei in the valley in the vicinity of the mountain, collection of a sample of the exhaust from a jet engine to ascertain whether it contained sublimation nuclei, comparison of our routine sublimation nuclei counts against jet plane operation, a test of dry ice in the duct of the jet airplane, changing the photocell recorder galvanometer to a more sensitive one, changing the night photocell setup, conducting experiments with the dry ice nozzles, and other work.

Sublimation nuclei observations were made on a routine basis with no change in procedure. However, there has been a change in meaning of some of the items entered on the nuclei data sheets. The "present weather" entered is that of the new U. S. Weather Bureau code effective 1 January. The relative humidity is measured only on the six-hourly observations, and is the relative humidity with respect to water. Previously, the relative humidity at below freezing temperatures was with respect to ice.

The maximum sublimation nuclei count was less than expected, being only 1/cc.

Radio contacts with Schenectady were made on a routine basis during weekdays for most of the month, but the mountain was unable to establish contact with the Research Labomatory from the 25th through the 27th, apparently because of atmospheric conditions. The contacts continued to be useful for exchanging weather data,

[2/7/49]

news of anticipated visits to the mountain by G. E. personnel, results of experiments, etc.

The day photocell records were time-marked on a routine basis. There was no night photocell record until the 21st, when a waterproof cell was obtained. The night cell continued to give zero deflection whether in fog or not, so a change was made. The partition between the light and the photocell was removed, and the light was raised approximately 1-1/2 inches, to be above the level of settled snow. The cell mounting was changed. The cell is mounted on a plywood board which is clamped to a male taper. The cell presently makes an angle of about 60° with the light, but the angle can be changed by loosening the clamp on the taper. The photocell recorder reads 0.23 full scale in clear air, fluctuating somewhat. The new night photocell system was installed on the 27th and is working satisfactorily, indicating the presence of fog and snow and varying with conditions. The problem of ice accumulation has not been solved, however.

It was decided to increase the sensitivity of the photoelectric recorder so that the night photocell would not read zero. A galvanometer with full-scale sensitivity of 33 microamperes was obtained from G. E. and installed on the 20th, after considerable difficulty in getting the recorder to work properly. The day photocell deflection was now well offscale, so 7000 ohms of resistance was placed in the day photocell circuit to reduce sensitivity to a satisfactory level. So far, the day photocell has not gone off scale, but possibly in summer it will be necessary to increase the resistance in the day cell circuit. As mentioned above, the night photocell continued to read zero, even with the more sensitive galvanometer, until the night photocell setup was changed as noted.

In the hope that the tapered cone could be used in the duct of the jet engine in connection with the dry ice experiments, to reveal the size of the fog droplets, the routine collection of data from the vaned, tapered cone was continued. A plot of R_u vs. psi on logarithmic graph paper indicated that R_u varies approximately as the inverse square of psi. (The Reynolds number, R_u, is defined as

$$R_u = \frac{2a\rho_a U}{\eta}$$ where

a is droplet radius
ρ_a is air density
U is air speed relative to the tapered cone
η is viscosity of the air, all in cgs units

Psi is the "scale modulus":

$$\psi = 9\rho_a c / \rho_w d^2$$ where

a and ρ_a have the same meaning as above
ρ_w is the density of water at the ambient temperature

C is the radius of the tapered cone at the point at which the diameter of the buildout of ice equals the diameter of the cone)

Deviations from the inverse square relationship are large, and as yet unexplained, so that the tapered cone cannot yet be used in drop size determinations.

Mr. Smith-Johannsen and Mr. Blanchard, of G. E., arrived at the Observatory on January 18. The former had an antice compound which he tried out on the bullet nose of the G. E. jet engine, , and on a model propeller, which could be run at any desired speed up to several thousand RPM by varying the voltage supplied the motor to which the propeller shaft was attached. The propeller was run in 2-½ hours of moderate to heavy icing, in approximately 6 hours of rain, and in still more icing without decreasing the effectiveness of the antice. The antice worked fairly well on the bullet nose of the jet engine, also, and Mr. Johannsen was encouraged by the results of the tests. Experiments with the antice on the model propeller will be conducted whenever the conditions specified for its use are present on the summit.

Dr. Vonnegut and Mr. Falconer of the G. E. Research Laboratory were in the valleys in the vicinity of Mount Washington with a portable silver iodide generator from the 18th through the 20th. However, the weather was unsuitable for the tests on the 19th. Radio communication with the generator was maintained during the tests. Sublimation nuclei tests were taken at fifteen minute intervals during the test period on the 18th and at half hour intervals on the 20th. The results of the tests were disappointing. There was little or no evidence of the presence of increased sublimation nuclei at the summit due to the tests. The nuclei test results are given in the enclosed table.

Mr. Falconer suggested testing the exhaust of a jet engine for sublimation nuclei. The exhaust from the Pratt and Whitney jet engine was collected in a gallon bottle. There were many nuclei present. At Mr. Falconer's request, a comparison was made between the sublimation nuclei counts obtained when the jet engine was in operation and the nuclei counts obtained when the jet engine was not in operation. The data is enclosed. It indicates that any nuclei from the jet have not affected our data appreciably, a conclusion supported by an observation from Mr. Dickey, in charge of the Navy project, to the effect that he has observed the flow of the jet exhaust carefully and is certain that in westerly winds there is no opportunity for the exhaust to get around to the west side of the mountain. Since the jet engine usually operates in winds from westerly directions only, there would not be much chance for nuclei from the jet to get into the nuclei chamber. A sample of the exhaust of the Observatory oil burner contained no

sublimation nuclei. A sample of the diesel exhaust will be obtained when the weather permits.

Only one test of dry ice with the jet engines was made. As the enclosed data shows, trouble with CO_2 flow through the nozzles prevented a successful test. Since this result is similar to all but one of last year's tests, it is evident that even if dry ice should prove to be an answer to the problem of icing in jet engines, care will have to be taken to ensure that proper CO_2 flow is maintained.

No wire screen runs were made in January, since the problem of maintaining CO_2 flow through the nozzles had not been solved. It soon became evident that conditions outdoors were too severe on the average to be able to conduct tests, designed to make the nozzles work, as often as desired. Therefore, a CO_2 bottle was set up in the basement of the Observatory, just inside the cellar door, where the CO_2 flow could be directed out the building.

The new nozzles sent up by Dr. Schaefer were tried out. They failed to perform noticeably better than the others. The finned nozzle did not work well either. In a conversation with Mr. Dickey, of the Navy project, it was decided that either heating the nozzles should be tried, or else new nozzles should be built, incorporating Dr. Howell's idea that the nozzles should be constructed so that any dry ice forming inside the nozzle due to reduced pressure where the streamlines converge would be formed so near the throat that it would be expelled with the gas.

It was decided to try heating the nozzles first, especially as the G. E. jet engine would not be available for further dry ice tests until March. The first attempt involved permafilling the nozzle, wrapping nichrome wire around the nozzle, then permafilling the wires to the nozzle. Even ten amperes was insufficient to keep the nozzle warm when the CO_2 was flowing rapidly, because of the thermal insulation provided by the permafil on the nozzle.

When the wires were soldered directly to the nozzle, most of the heat was dissipated in the wires and the nozzle did not get hot with ten amperes applied. Heating the nozzles with a blow torch sufficed to keep the nozzles from plugging up, proving that heating the nozzles was a valid method of keeping them from blocking. Indicative of the amount of heat required is the fact that even under the direct blow torch flame dry ice formed on the divergent cone of the nozzle. The blow torch raised the CO_2 stream temperature considerably. No check was made to see whether nuclei were still being formed.

[2/7/49]

The latest test has been of an unpermafilled nozzle wrapped with nichrome wire, which has been permafilled to insulate it from the nozzle. The first test was very encouraging, but in two subsequent tests the nozzle has blocked after about three minutes, even with ten amperes applied.

All of the tests of heated nozzles have been with the new nozzles. A disadvantage of the divergent cone is that when the nozzles start to block, the CO_2 stream, instead of shooting forward is directed against the divergent cone, cooling off the nozzle just when more heat should be applied. From time to time dry ice is blown out the nozzle and the flow is normal for a few seconds. In every test the larger size nozzles have worked best.

Experiments with heated nozzles will be continued until either a satisfactory solution is found, or until it becomes evident that nozzles of a new design are needed.

In addition to solid impurities, oil and perhaps water are sometimes found in the CO_2. What effect the impurities have on nozzle performance is uncertain, but is probably small, except for the water, since a wire filter keeps the solid particles from the nozzle.

Minor matters attended to during the month included cleaning the ink well of the photoelectric recorder, (which took three hours), photographing the ice collection on the model propeller, etc.

Future work will continue on the line of getting the nozzles to work; then obtaining wire screen runs and tests with the jet engine. It may be possible to keep the night photocell free of ice by heating it. The attempt will be made shortly. Samples of exhaust from possible local sources of sublimation nuclei will be tested in the cold chamber."

Sincerely,

Wallace E. Howell

Wallace E. Howell
Director

encs.

MOUNT WASHINGTON OBSERVATORY

GORHAM, NEW HAMPSHIRE

2 Divinity Avenue
Cambridge 38, Mass.
March 8, 1949

Dr. Vincent J. Schaefer
Research Laboratory
General Electric Company
Schenectady 5, New York

Dear Vince:

The following has been reported by Mr. R. B. Smith as a summary of the work done at the Mount Washington Observatory, for the General Electric Company during February 1949.

"The work included routine sublimation nuclei counts, routine radio contacts with the Research Laboratory at Schenectady, routine time-marking of photocell records, and a few special projects.

Sublimation nuclei counts were taken on a routine basis. No particularly unusual counts were noted. The maximum count was 2/cc. The intake pipe to the cold chamber was close to the level of the drifted snow throughout the month.

Frequently it was difficult to establish radio contact with Schenectady, particularly with the afternoon contacts. This was probably due to atmospheric conditions. At times, messages were relayed by the Schenectady airport station. The contacts that were made were as useful as ever.

Photocell records were obtained on a routine basis for both day and night photocells. The photocell recorder sometimes acts anomalously when it is switched from the day cell to the night cell, first going strongly positive, then slowly going negative, off scale. It stays negative for a variable time and then returns to its normal position. At other times when the recorder is switched from the day cell to the night cell, the pen indicates high and decreases exponentially to its normal value.

Interpretation of the night photocell trace may be difficult for the following reasons: since no nichrome ribbon was available, having been used on another project, the attempt to keep the night cell ice-free could not be made, so that the scale reading diminishes as the cell ices up, or gets covered

with snow. Snow in the air, whether blowing or falling, increases the scale reading. There is sometimes a secular change in the reading when the summit is not in the fog.

The angle of the photocell makes with the light was changed on 21st February, so that the reading would be nearly zero when the summit was not in the fog. This reduces the indication when the summit is in fog, and is perhaps undesirable for that reason. The cell now makes an angle of about ten degrees with the light beam.

Little work was done with dry ice. It was found that one of the new nozzles did not clog up when used with the thin copper tubing. One of the old nozzles was ground down externally to much smaller dimensions, retaining the hexagonal shape. The orifice was not touched, the intention being to remove excess metal so that the ambient air could be more effective in raising the nozzle temperature at the throat. The diameter of this nozzle at the orifice end is now less than that of the new nozzles. The nozzle did not block in a test lasting more than three minutes. It is proposed to use both these nozzles in wire screen runs on a routine basis as soon as weather conditions permit. If necessary, heat will be applied electrically to try to keep them from blocking.

For dry ice tests in the jet engine, Mr. Dickey of the Navy project has made an elaborate nozzle embodying a principle discussed with Dr. Howell. The nozzle is built so that dry ice particles will not form before reaching the throat or at least until they are in a position where they will be expelled by the escaping gas. Throat diameter is about .040". The approach to the throat is rounded. There are a number of warming fins to facilitate heat transfer with the air. A filter made from an oil burner filter will remove solid particles. From the throat the dry ice goes to a distributor with six equally spaced openings. The plan was to place the nozzle in the center of the jet duct and obtain good distribution of dry ice through the distributor, but in a test the distributor blocked after a few minutes, and will therefore probably not be used.

On 21st February, the air was saturated with respect to ice but not with respect to water, so the valve of a CO_2 was opened. A few feet downwind a cloud began to form, which increased in size as it moved from the summit. A radio contact prevented motion pictures from being taken at the time. The cloud was visible for several hundred yards after it left the summit. After the contact, which lasted less than fifteen minutes, the air was no longer saturated with respect to ice. (Motion pictures of this phenomenon were obtained 3 March).

The afternoon of 28 February conditions seemed favorable for a test of the effect of silver iodide on Altostratus clouds, so at 1616 two charcoal briquettes were ignited and placed on a support on a taper in the tower. A strong easterly wind was blowing. The AS were estimated to be 4-5000 feet above the mountain. Before seeding there was a sort of roll cloud at the bottom of the AS, uniform in shape from north to south, several miles west of the mountain. Small wisps of virga came from the cloud.

About ten minutes after seeding, the cloud to the west of the mountain started to change. The roll shape disappeared, and the cloud base appeared to have lowered approximately a thousand feet, giving a great increase in the amount of virga, all of which apparently evaporated long before reaching ground.

The modified cloud persisted unchanged for perhaps twenty minutes, and then began to resume the roll shape characteristic of the edge of the cloud as a whole. An hour after initial seeding, the cloud was again of uniform shape, the cloud base having lowered, meanwhile, approximately 2000 feet. If favorable conditions occur again, efforts to modify clouds with silver iodide will be repeated."

Sincerely,

Wallace

WALLACE E. HOWELL
Director

WEH/w

encs.

MOUNT WASHINGTON OBSERVATORY

GORHAM, NEW HAMPSHIRE

2 Divinity Avenue
Cambridge 38, Mass.
April 7, 1949

Dr. Vincent J. Schaefer
Research Laboratory
General Electric Company
Schenectady 5, New York

Dear Vince:

I have just learned from the Yankee Network that they are willing to allow us to take over the lease to their building at Mount Washington on July 1. You are fully aware what this would mean for us in terms of improved facilities for scientific work as well as better accommodations for the crew. It is part of our plan to build a hemispherical dome on top of the antenna loft with an annular walkway, surmounted by a hydraulic lift and an instrument mast.

Whether or not we can undertake this large a financial burden depends on the amount of contract work we can look forward to during the next couple of years. I would therefore like to have whatever information you can give at this time regarding your intentions of continuing work at Mount Washington and the amount of work that may be called for in your plans.

We can safely count on being able to have up to three full-time observers (two at the summit at any one time) for your work. I hope very much that you may be able to install one of Vonnegut's continuous recorders of condensation nuclei, as I am very eager to get data from it. I am sure we will be able to make a more representative exposure for the sublimation nucleus counter, more free from drifting snow. The screen studies of CO_2 effect could be moved to the roof of the northeast wing, where the airflow would be far more favorable. I have not lost hope that we can collaborate with NACA on the wax project, too.

This is written in haste and now I must run. I will amplify later if you indicate an interest.

Regards,

Wallace E. Howell

WEH/w

MOUNT WASHINGTON OBSERVATORY

GORHAM, NEW HAMPSHIRE

2 Divinity Avenue
Cambridge 38, Mass.
April 7, 1949

Dr. Vincent J. Schaefer
Research Laboratory
General Electric Company
Schenectady 5, New York

Dear Vince:

The following has been reported by Mr. R. B. Smith as a summary of the work done at the Mount Washington Observatory for the General Electric Company during March 1949.

"Routine sublimation nuclei counts, time-marks of the photocell recorder, and daily radio contacts with Schenectady were continued during March 1949. It was not possible to make wire screen runs on a routine basis, though a number of runs were made. A test in which dry ice was released from a CO_2 bottle when the relative humidity was 100% with respect to ice at the summit caused a relatively large cloud of ice nuclei, as described in a report sent to Schenectady.

The inlet to the sublimation nuclei chamber was only slightly above the level of drifted snow all through the month. Possibly this had some effect on the counts obtained. If so, the effect is not readily apparent. The maximum count for the month was 1-2/cc.

The anomalous behavior of the photocell recorder, as described in a previous monthly report, continued. Night photocell records were influenced by icing up of the cell at times, but it was possible to de-ice it frequently during an icing period. The recorder seemed to work better with the cover removed, so the cover was seldom left on.

As Mr. Falconer had predicted, the afternoon radio contacts with Schenectady were increasingly difficult to establish as the month wore on, due to atmospheric conditions. Morning contacts during weekdays were successful, except when the antenna got wet in rainy weather.

Dry ice runs were not too successful. No runs were made in the jet engine duct, since the G. E. jet was not in operation during the month. The wire screen runs could not be continued long enough to get a sizeable buildout of ice, for the most part,

MOUNT WASHINGTON OBSERVATORY

GORHAM, NEW HAMPSHIRE

2 Divinity Avenue
Cambridge 38, Mass.
March 8, 1949

Dr. Vincent J. Schaefer
Research Laboratory
General Electric Company
Schenectady 5, New York

Dear Vince:

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Interpretation of the night photocell trace may be difficult for the following reasons: since no nichrome ribbon was available, having been used on another project, the attempt to keep the night cell ice-free could not be made, so that the scale reading diminishes as the cell ices up, or gets covered

with snow. Snow in the air, whether blowing or falling, increases the scale reading. There is sometimes a secular change in the reading when the summit is not in the fog.

The angle of the photocell makes with the light was changed on 21st February, so that the reading would be nearly zero when the summit was not in the fog. This reduces the indication when the summit is in fog, and is perhaps undesirable for that reason. The cell now makes an angle of about ten degrees with the light beam.

Little work was done with dry ice. It was found that one of the new nozzles did not clog up when used with the thin copper tubing. One of the old nozzles was ground down externally to much smaller dimensions, retaining the hexagonal shape. The orifice was not touched, the intention being to remove excess metal so that the ambient air could be more effective in raising the nozzle temperature at the throat. The diameter of this nozzle at the orifice end is now less than that of the new nozzles. The nozzle did not block in a test lasting more than three minutes. It is proposed to use both these nozzles in wire screen runs on a routine basis as soon as weather conditions permit. If necessary, heat will be applied electrically to try to keep them from blocking.

For dry ice tests in the jet engine, Mr. Dickey of the Navy project has made an elaborate nozzle embodying a principle discussed with Dr. Howell. The nozzle is built so that dry ice particles will not form before reaching the throat or at least until they are in a position where they will be expelled by the escaping gas. Throat diameter is about .040". The approach to the throat is rounded. There are a number of warming fins to facilitate heat transfer with the air. A filter made from an oil burner filter will remove solid particles. From the throat the dry ice goes to a distributor with six equally spaced openings. The plan was to place the nozzle in the center of the jet duct and obtain good distribution of dry ice through the distributor, but in a test the distributor blocked after a few minutes, and will therefore probably not be used.

On 21st February, the air was saturated with respect to ice but not with respect to water, so the valve of a CO_2 was opened. A few feet downwind a cloud began to form, which increased in size as it moved from the summit. A radio contact prevented motion pictures from being taken at the time. The cloud was visible for several hundred yards after it left the summit. After the contact, which lasted less than fifteen minutes, the air was no longer saturated with respect to ice. (Motion pictures of this phenomenon were obtained 3 March).

MOUNT WASHINGTON OBSERVATORY

GORHAM, NEW HAMPSHIRE

2 Divinity Avenue
Cambridge 38, Mass.
April 7, 1949

Dr. Vincent J. Schaefer
Research Laboratory
General Electric Company
Schenectady 5, New York

Dear Vince:

I have just learned from the Yankee Network that they are willing to allow us to take over the lease to their building at Mount Washington on July 1. You are fully aware what this would mean for us in terms of improved facilities for scientific work as well as better accommodations for the crew. It is part of our plan to build a hemispherical dome on top of the antenna loft with an annular walkway, surmounted by a hydraulic lift and an instrument mast.

Whether or not we can undertake this large a financial burden depends on the amount of contract work we can look forward to during the next couple of years. I would therefore like to have whatever information you can give at this time regarding your intentions of continuing work at Mount Washington and the amount of work that may be called for in your plans.

We can safely count on being able to have up to three full-time observers (two at the summit at any one time) for your work. I hope very much that you may be able to install one of Vonnegut's continuous recorders of condensation nuclei, as I am very eager to get data from it. I am sure we will be able to make a more representative exposure for the sublimation nucleus counter, more free from drifting snow. The screen studies of CO_2 effect could be moved to the roof of the northeast wing, where the airflow would be far more favorable. I have not lost hope that we can collaborate with NACA on the wax project, too.

This is written in haste and now I must run. I will amplify later if you indicate an interest.

Regards,

Wallace E. Howell

WEH/w

[4/7/49]

because the nozzle blocked after a minute or two. Thus effect of dry ice tended to be masked by the icing that occurred before the dry ice could be turned on and after the system failed. Another trouble was the turbulence of the wind at the exposure site between the Observatory building and the Yankee Network building. It was necessary to increase the separation between the screen subjected to dry ice and the control screen to 22" to make sure that dry ice did not flow over the control screen. The turbulence was so great it became a problem to direct the CO_2 stream to the intended screen. In every run the wind occasionally reversed direction completely. Not only was it difficult to keep the CO_2 stream directed over the screen, but it was a problem to keep shielding of the screen by the nozzle and tubing, and by the hand of the observer, a minimum. Some shielding did occur.

It is not surprising that the effect of dry ice was not noticeable in most cases. (See attached dry ice experiment sheet.) In a few cases, with temperatures near freezing, the effect was to increase buildout slightly, if anything. In one case, with a temperature of 19°F., the decrease in buildout was quite noticeable.

In order to obtain better exposure conditions, the location of the stand for the wire screens was moved about ten feet to a site where the turbulence is probably less than at the old location.

Because the amount of time available for experimentation was reduced by other projects, it was thought desirable to obtain another man, whose time would be spent almost entirely on G. E. work, even though the crowded facilities at the Observatory would become even more so. It is anticipated that this man, Charles O. Harrington, now Resident Observer at the Blue Hill Observatory, will report for work on April 7, the day Dr. Schaefer is expected at the Observatory. Thus Dr. Schaefer will be able to give him instructions in person.

Mr. Dickey has offered to lend us the nozzle he made for use in the jet duct, which did not block in a thirteen minute test. We hope the length of exposure of the screens can be increased by this means to a point where the effect of the dry ice will be readily apparent. When tests can be made with the G. E. jet engine, the nozzle will be used there, though distribution in the duct may remain something of a problem.

[9/7/49]

No further tests of the effect of dry ice on air saturated with respect to ice had been made by the end of the month, though a test which produced snow at the summit was made on April 2, with the summit just in fog. A report of this test will be sent to Schenectady within a few days. Since this test was made at night no photographs were obtained, but it is expected that future tests will be photographed more completely than the experiment of March 3."

Sincerely,

Wallace E. Howell

WALLACE E. HOWELL
Director

enc.

WEH/w

[4/7/49]

DRY ICE EXPERIMENTS

Dry ice tests in Observatory:

2/26/49 New CO_2 bottle. In greater than three minute test, no blocking in new .020 inch nozzle. Old nozzle cut down by Whitey.

2/28/49 Old .030 reduced nozzle worked successfully in 3-1/3 minute test. Partial blocking at start of run cleared and there was no blocking afterward.

Wire screen runs:

3/6/49 1600. Temperature 12°F., wind NW 24 mph. Ground nozzle. Nozzle okay in three minute run. Turbulent wind -CO_2 stream got on screen not more than quarters of time. It also got on the non-CO_2 screen. No noticeable difference in the amount of icing on any of the meshes. Photos Nos. 1 and 2, pack 1 3/49.

3/22/49 2000. T 30°F., SW 51 mph. Very gusty wind. Ground nozzle. Coverage on screen 70% of time. CO_2 stream 5 inches below and 15-18" to windward. Little difference in buildout. Possibly greater on CO_2 screen. Photos taken with the screens reversed through an error.

3/28/49 0915. T 26°F., WNW 63 mph. Ground nozzle, blocked after about two minutes. Held 10-12" to windward. Stream taken to screen by wind only. Coverage near bottom of screen 80-90%, less above. No appreciable difference in buildout. Perhaps more on CO_2 screen. Photos Nos. 5 and 6, pack 1 3/49.

3/28/49 1615. T 22°F., W 52 mph. Ground nozzle clogged in about 1 1/2 minutes. Could not loosen screens from their holders, so each screen was photographed separately. No discernible difference in buildout between the two screens. Dry ice was held 6-8" to windward of the screen. Apparently did not get line completely dry when brought it in (see below) because the nozzle had a fine uniform film of ice all over the inside. Photos Nos. 7, 8, and 9 pack 1, 3/49.
1420. Nozzle failed almost at once, so run terminated. Line baked in oven for 1/2 hour. Then cooled before being put back on CO_2 bottle.

3/28/49 1920. T 19°F., W 51 mph. Gusty wind. Ground nozzle, for 2 1/2 minutes. CO_2 6-12" to windward of screen. Definitely less on CO_2 screen. Photos Nos. 10 and 11, 3/49-1 pack.

3/28/49 2210. T 19°F., W 65 mph. Ground nozzle blocked shortly after start of run, so run terminated.

[4/1/49]

3/28/49 2300. T 18°F., W 70 mph. Ground nozzle worked somewhat less than a minute. CO_2 bottle seemed empty. Slightly less buildout on CO_2 screen. Photo No. 12, 3/49-1 pack. Took tubing off as it seemed to be blocking with the nozzle removed. Dry ice on filter, which is to be expected, I suppose. Tubing dried by heating in oven (275°F)
Nozzle had some ice in it when removed after the run above, but blocking probably occurred in the tubing.

3/31/49 Moved stand for wire screens ten feet east toward the Observatory building, where it is expected the exposure will be better, the wind stronger and less turbulent.

MOUNT WASHINGTON OBSERVATORY

GORHAM, NEW HAMPSHIRE

April 9, 1949

DRY ICE EXPERIMENTS

Seeding Experiment 2 April, 1949:

About 0245, Smith went over to edge of summit, where lights of North Conway were dimly visible. In the projector spotlight beam it could be seen that the summit was just below and occasionally in the bottoms of the clouds. No stars were visible. The clouds were blowing from the north or northwest about 10 mph. Returning toward the upper parking lot, Smith was surprised to see fog blowing across the area from the south or southeast. A few moments later the prevailing northerly wind returned and swept the fog away. The temperature was about 16°F.

At approximately 0250 a CO_2 bottle was turned on slightly. The expected ice cloud developed, increasing in size downwind. When Smith got away from the area, he could see that a surprisingly large cloud was being produced, a stream 3-5 feet deep sweeping over the Stage Office roof along approximately two thirds of the building's length. This was in addition to the main stream, which was being swept rapidly out of sight by the wind.

Oyler was called out at about 0255, the bottle being turned off for approximately two minutes. The ice cloud was swept away by the NW wind when the bottle was turned on again. Because the summit was in fog, less of the effect of the dry ice was evident than previously. However, the wind reversed direction, and against the spotlight myriad nuclei were visible. The nuclei were evident in undiminished numbers during the time the SE wind blew at least 30 seconds at about 12 mph. The edge of the light could not be seen sharply, as before. When gusts blew, either the left sundog of the 22° halo, or an arc of the halo of 22° at a point nearly on the same horizontal plane as the light was visible. This phenomenon was only visible when the wind was blowing faster than usual. Some color was noticeable, particularly green and red.

The CO_2 was allowed to flow for approximately seven minutes and then turned off. The whole area swarmed with nuclei; to such an extent that Smith remarked that there were far too many nuclei for snow to be produced until the concentration diminished. The scintillating nuclei reminded one somewhat

of a tremendous swarm of meteors, except that some nuclei appeared as "dots" and some as "dashes."

The wind continued to alternate between southeasterly and northerly. At times the lights of North Conway were completely invisible. At others, North Conway, the Glen House, and Berlin were clearly visible.

After a while the nuclei could be felt on the face, though still too small to catch. It began to snow about 0312. Efforts to catch the snow on the snow typer were largely unavailing, but enough were caught to identify them. The first snow was P-2 from .5 to 1.5 mm. With a sudden wind shift to a northerly wind, the snow content of the air increased, and large flakes became visible. Unfortunately, none could be caught. A conservative estimate is that they were 3/8" in diameter. They were probably 1/2" or larger. They were outnumbered by the smaller crystals, however. Crystals now caught included P-1, 1-2 mm, often somewhat rimed. P-2, .5-1.5 mm, P-6, approximately 4 mm, and P-7, 2 mm, at least one of which was apparently a fragment of P-1.

As the snow continued, the number of nuclei visible decreased. A nuclei count was taken about 0330. Air in the chamber had two or three nuclei. When outside air was introduced, the count went up to about 1/4-1/2 per cc, very few new nuclei becoming visible from growth from vapor supplied by the breath, almost all coming from outside in visible size. The count seemed low from the number of nuclei previously seen, but upon going back outside it was seen that the number of visible nuclei had greatly diminished.

The snow was continuing, but consisted mostly of P-2, with few large flakes. Away from the summit, the wind direction continued to be prevailingly northerly, while even at the summit the southeast wind seemed to have almost disappeared.

The summit came out of the fog. At 0345, the CO_2 was turned on for about ten seconds in a northwest wind. Soon the SE wind returned and the nuclei swarmed in numbers as great as any previously. This kept up for about five minutes. Then it started to snow P-2, .5 mm mostly. A sharp wind reversal back to northerly brought a shower of large flakes again, these not being caught either.

Ice on the ground was covered with a layer one or two snow crystals thick. Examination of the layer revealed many P-1s, and a good many P-7s. Possibly the P-2s got blown away by the wind.

[4/9/49]

From time to time 2 order coronas could be seen against the light even with numbers of nuclei present, though never when the nuclei counts were very high. Glorys could also be seen. At one time it was Smith's and Oyler's impression that the effect of the nuclei had been to "dry up" the cloud, for Vega became visible and it seemed as though the clouds in the vicinity of the summit had dissipated. The clouds soon returned, however.

Whether the dry ice released was responsible for all the snow formed is uncertain, for it had been snowing very slightly off-and-on for several hours before the experiment. The simultaneous presence of snow and numbers of nuclei seemed to show that the dry ice was responsible for much of the snow produced, at least. It was noticeable that snow was never present when the highest nuclei counts were present.

While this type of experiment uses much CO_2, it is the feeling of Smith that this type of experiment should be continued, under favorable conditions, until more is learned about optical effects, snow type produced, length of persistence, amount of snow produced, and modifications in the clouds.

(Note: The "sundog" or the arc of the 22° halo mentioned in the third paragraph of this report was seen only after the first seeding, for only a few seconds.)

Wallace E. Howell

WALLACE E. HOWELL
Director

WEH/w

MOUNT WASHINGTON OBSERVATORY

GORHAM, NEW HAMPSHIRE

2 Divinity Avenue
Cambridge 38, Mass.
May 9, 1949

Dr. Vincent J. Schaefer
Research Laboratory
General Electric Company
Schenectady 5, New York

Dear Vince:

The following has been reported by Mr. Robert B. Smith, Chief Observer, as a summary of the work done at the Mount Washington Observatory for the General Electric Company during April 1949:

"Sublimation nuclei counts, radio contacts with Schenectady, time-marking of photocell recorder were continued on a routine basis during April, 1949. Mr. Charles O. Harrington started work on 8 April. Wire screen runs were taken, and one experiment was made with dry ice to seed a cloud.

The sublimation nuclei count was fairly low for the month, and the maximum was 1/2/cc. The inlet pipe to the cold chamber was higher above the drifted snow than during the preceding two months.

Radio contacts with Schenectady were maintained on a routine basis, except when atmospheric conditions prevented contacts from being made. Interference in the afternoon occurred a number of times.

The photocell records were obtained on a routine basis, though occasional trouble was experienced with the recorder.

Mr. Charles O. Harrington, formerly resident observer at the Blue Hill Observatory, reported for work at the Observatory 8 April. He is spending most of his time on G. E. work, particularly experimentation with dry ice.

Wire screen runs were taken on as much of a routine basis as conditions would permit. The pictures taken with the successful runs have not yet been developed. In general, the runs

[S/9149]

bear out the findings of last year that the lower the temperature the more effective the dry ice in reducing icing. Trouble with clogging of the nozzle continued to limit the length of exposure of many runs. Tom Dickey's nozzle was not used in a successful run. A summary of the wire screen runs is enclosed.

Another experiment to seed clouds near the summit was conducted on 2 April, using dry ice. A full report of the results has been sent to Schenectady. It is reasonably certain that the dry ice released was responsible for much of the snow which fell at the summit subsequent to the seeding. Because the experiment occurred at night no pictures were taken. Conditions have not been favorable for such experiments since then, for frequent attempts to create a cloud of ice nuclei just before the summit entered the clouds, or just after the summit has emerged from the clouds were unsuccessful."

Sincerely,

Wallace E. Howell, Director

WEH:w

enc.

[5/9/49]

Mount Washington Observatory

Dry Ice Experiments

Seeding Experiment 2 April, 1949
(Report sent to G. E.)

Wire Screen Runs

4/7/49 1100. Temperature 18°F., wind W 73mph. Screens exposed at new site for one and one-half minutes. Ground nozzle failed. Fairly good ice collection on both screens. No discernible difference. Dry ice 10 inches to windward. Photos 3 and 4, pack 3/49-2.
In this wind, new site was quite satisfactory. No check run on relative icing two screens, but wind did not reverse direction or change direction much, though strength varied greatly.
CO_2 flow small, as if nozzle blocking or bottle nearly empty, but rate of flow fairly uniform until nozzle failed. Nozzle had dry ice inside.

4/7/49 1400. T 20°F., WNW 65mph. Ground Nozzle used. Screens exposed about I minute before CO_2 on. CO2 on about 3 1/2 minutes. Photos 5 and 6, pack 3/49-2.
Little difference in buildout. CO_2 held 1 to 2 feet to windward. Incomplete coverage at 1 foot. Nozzle started to fail several times but recovered. Density slightly less on C than on NC.
Would have been good run if had not had icing without CO_2 at start of run.

4/7/49 1600. T21°F.,W 65mph. Ground nozzle. Icing fairly heavy. CO_2 on about 2 minutes without failure. Some turbulence, CO_2 on 6 90-95% of time, 2 1/2 to 3 feet to windward of C. Possibly slightly less buildout on C screen. Slightly less dense on C screen. Photos 7and 8, pack 3/49-2.

4/7/49 1915. T 21°F.WNW 61mph. Wire screens exposed without dry ice for about 45 seconds, then CO_2 bottle valve opened. CO_2 on nearly full for two or three minutes, most of it passing below C screen. Much of upper part of C screen in very little CO_2.
Somewhat less buildout on C than on NC. Density less on C. Photos 9 and 10, pack 3/49-2.

4/7/49 2210. T 21°F. WNW41 mph. CO_2 bottle as in last observation. Thought coverage would be complete with lighter wind, but it was not. CO_2 began to fail after 1 1/2 minutes, so terminated run. Buildout possibly less on C, and density slightly less. CO_2 3 feet from C screen. Photos 11 and 12, pack 3/49-1.

4/16/49 2245. T 15°F. WNW 24mph. Dried line in oven before run. Ground nozzle used. Stars visible at times - out of fog at end of run. Wind somewhat gusty. Coverage greater than 90% of the time. Nozzle failed after 1 1/2 minutes. Definitely less ice on C, especially noticeable on center screen. Density possibly less NC than C. Photos 1 and 2, pack 4/49-1. Icing fairly heavy.

CS/9/49]

4/17/49 0930. T 15°F. N 14mph. Ground nozzle used. CO_2 directed at C screen 5 minutes. CO_2 blew at NC screen at times. Not enough buildout to note comparison, although density on C screen appeared less than that of NC screen. Icing rather light. Photos 3 and 4, pack 4/49-1.

4/17/49 1100. T 15°F. NNW 14mph. Ground nozzle used. Run was unsuccessful as CO_2 flow stopped after 15 seconds.

4/17/49 2000. Ground nozzle used. Run was unsuccessful as CO_2 failed after 15 seconds.

4/17/49 2230. T 15°F. ENE 18mph. Ground nozzle used. CO_2 failed after 5 minutes. Icing very light - no noticeable difference in buildout, but density on NC screen probably greater than on C screen. Photos 6 and 8, pack 4/49-1. (Photos 5 and 7 spoiled)

4/18/49 1345. T 18°F. sse 31mph. Ground nozzle used. CO_2 flowed for 3 1/2 minutes. Icing very light. C screen appeared whiter than NC screen. Icing too light for photos.

4/18/49 1945. T 12°F. SSE 31mph. Ground nozzle used. CO_2 failed after 8 minutes. Buildout appeared greater and density greater on C screen than on NC screen. Full force of CO_2 lasted one minute - then force decreased somewhat. Photos 9 and 10, pack 4/49-1.

4/19/49 1400. T 29°F. SSW 27mph. Ground nozzle used. Run terminated after ten minutes. Density and buildout about the same on both screens, although ice had a whiter appearance on the C screen. Photos 11 and 12, pack 4/49-1.

4/19/49 1945. T 21°F. WNW 31mph. Ground nozzle used. Run terminated after 10 minutes. Density greater on NC screen than on C screen. Buildout somewhat greater on NC screen. Photos 1 and 2, pack 4/49-2.

4/20/49 0845. T 19°F. WNW 61mph. Ground nozzle used. Run terminated after 7 minutes. Buildout and density noticeably greater on NC screen than on C screen. (Especially on center screen.) Photos 3 and 4, pack 4/49-2.

4/21/49 0900. T 28°F. WNW 59mph. Ground nozzle used. Run terminated after 10 minutes. Moderate icing. Density and buildout greater on Nc screen than on C screen. Photos 5 and 6, pack 4/49-2.

4/21/49 1100. T 29°F. WNW 54mph. Ground nozzle used. Flow of CO_2 somewhat weak. Run terminated after 10 minutes. Buildout and density greater on Nc screen than on C screen. Photos 7 and 8 4/49-2.

4/26/49 1645. Tom Dickey's nozzle blocked with pipe scale.

4/27/49 0945. TD's nozzle blocked from ice from water - had just cleaned nozzle and melted ice on tubing in putting nozzle on.

4/28/49 1130. CO_2 system failed. Took TAD's nozzle off, not blocking. 1245 Removed tubing. Found filter on CO_2 bottle filled with impurities and ice.(Dry ice?) Dried line in oven. Changed position of TAD's filter so that it is between 1/8th pipe and nozzle, to absorb pipe scale and impurities in the pipe.

MOUNT WASHINGTON OBSERVATORY

GORHAM, NEW HAMPSHIRE

2 Divinity Avenue
Cambridge 38, Mass.
June 7, 1949

Dr. Vincent J. Schaefer
Research Laboratory
General Electric Company
Schenectady 5, New York

Dear Vince:

The following has been reported by Mr. Robert B. Smith, Chief Observer, as a summary of the work done at the Mount Washington Observatory for the General Electric Company during May, 1949:

"Sublimation nuclei counts and time-marking of the photocell recorder were continued on a routine basis during May, 1949. The radio contacts with Schenectady were discontinued on May 10th. Because there was little icing during the month, except towards the end, only one wire screen run was made.

Sublimation nuclei counts were taken on a routine basis. The maximum count was 1/cc.

The photocell record showed that the trace when the summit was in fog was similar at times to the trace when clouds were passing a few hundred feet over the summit. Also worthy of note was the trace on May 27, when the summit was in the fog all day. The trace showed fluctuations over ten to fifteen minute periods, but the short period fluctuations usually present when the summit is in fog were largely absent. Presumably the cloud cover was quite thick and uniform.

Word was received from Mr. Falconer, of the Research Laboratory at Schenectady, to discontinue radio contacts until further notice, so use of the radio ended on May 10.

The wire screen run was made at a temperature of 29°F., and the buildout was greater on the screen subjected to CO_2, though the density was less on that screen, if whiteness of ice is an indication of density. Presumably the increase in buildout resulted because the dry ice lowered the air temperature enough so that some liquid water was caught which would otherwise have run off. Possibly the

[6/7/49]

lower density was also the effect of lower temperature.

Several more attempts were made to create and photograph an ice particle cloud, but without success. (See the enclosed report on dry ice experiments). Apparently low temperatures, preferably under 20°F., are necessary. Even when dry ice was released in fog, the effects were less spectacular than when released in clear air, saturated with respect to ice, at lower temperatures.

The photographs of the wire screen runs are being developed and printed.

Very truly yours,

Wally

WALLACE E. HOWELL
Director

WEH/w

encs.

[6/1/49]

MOUNT WASHINGTON OBSERVATORY

DRY ICE EXPERIMENTS

Wire screen runs:

5/14/49 2200 T 29°F. Wind WNW 31 mph, somewhat gusty at test site. Dickey's nozzle used. Blocked after 8 minutes. Buildout noticeably greater on CO_2 screen than on other screen. Density less than on non-CO_2 screen. Photos 9 and 10, 4/49-2 pack.

Seeding experiments:

5/22/49 1450 T 30°F. Clouds doming over summit, touching tops of Yankee tower. Released CO_2 from bottle. No cloud of nuclei. Tried another bottle. No luck.

5/28/49 1400 T 25°F. Small cloud produced. Did not last for more than 100 yards. Summit in and out of clouds at time.

At various other times dry ice was released, unsuccessfully.

MOUNT WASHINGTON OBSERVATORY

GORHAM, NEW HAMPSHIRE

2 Divinity Avenue
Cambridge 38, Mass.
July 15, 1949

Dr. Vincent J. Schaefer
Research Laboratory
General Electric Company
Schenectady 5, New York

Dear Vince:

The following has been reported by Mr. Robert B. Smith, Chief Observer, as a summary of the work done at the Mount Washington Observatory for the General Electric Co., during June, 1949:

"During June 1949, the routine observations for the General Electric Co. were continued at the Mount Washington Observatory.

Counts of sublimation nuclei were made on the schedule. The counts were mostly low during the month, the regular usual condition in the summer months. It is possible that the blower is run too long when warm air is brought into the cold chamber. Air is drawn into the chamber for one minute, and in summer the cold chamber is warmed considerably. The air cannot be chilled to as low a temperature, therefore, and possibly some sublimation nuclei are not activated. It is suggested that the blower be run 30 seconds when the ambient air temperature is greater than 40° F. The temperature of the air in the chamber could be made low at each observation, though the data might be considered non-homogeneous because air was drawn into the chamber for a different length of time.

Photocell records of sky brightness were time-marked, with appropriate remarks about the weather. It will probably not be necessary to decrease the sensitivity of the day photocell by increasing the resistance in the circuit, since the trace has not gone off scale yet. One of the "waterproof" photocells, used in the night cell, has had to be replaced because it lost sensitivity when water entered it."

[7/15/49]

"There were no radio contracts with Schenectady during June.

Photographs of the wire screen runs have been developed and printed. These prints are enclosed."

The photographs were exposed with the object of rendering the ice itself with normal film density, with the result that the background is greatly underexposed. The photo-finisher evidently printed for a balance between highlights and background; a better set of prints could probably be produced by printing darker on medium-contrast paper.

Sincerely yours,

Wallace E. Howell
Director

WEH/w

encs: 31 photographs and negatives
May and June Nuclei Data Sheets

MOUNT WASHINGTON OBSERVATORY

GORHAM, NEW HAMPSHIRE

2 Divinity Avenue
Cambridge 38, Mass.
August 9, 1949

Dr. Vincent J. Schaefer
Research Laboratory
General Electric Company
Schenectady 5, New York

Dear Vince:

The following has been reported by Mr. R. B. Smith, Chief Observer, as a summary of the work done at the Mount Washington Observatory for the General Electric Company, during July, 1949:

"During July 1949, the routine work for the General Electric Company by the Mount Washington Observatory staff was continued. No special observations or experiments were made.

Low sublimation nuclei counts continued in July. The maximum count was 7 nuclei per beam.

Photocell records of sky brightness were obtained on a routine basis until 27 July. On that day the paper feed mechanism of the photocell recorder failed. A cause of failure in the fast feed gear mechanism was a loose screw on one of the gears. The trouble in the slow feed gears was more difficult to locate. On 31 July the slow feed was operating but a only about half the former rate of feed. Paper movement was about 1 inch per hour instead of 2 inches per hour. It is expected this trouble will be overcome shortly."

The July Nuclei Data Sheets are enclosed herewith.

Sincerely,

Wally

WALLACE E. HOWELL
Director

WEH/w

enc.

MOUNT WASHINGTON OBSERVATORY

GORHAM, NEW HAMPSHIRE

2 Divinity Avenue
Cambridge 38, Mass.
September 7, 1949

Dr. Vincent J. Schaefer
Research Laboratory
General Electric Company
Schenectady 5, New York

Dear Vince:

The following has been reported by Mr. R. B. Smith, Chief Observer, as a summary of the work done at the Mount Washington Observatory for the General Electric Company, during August, 1949:

"Routine observations of sublimation nuclei numbers were made. The maximum number was 8 nuclei per beam.

The photocell recorder paper feed mechanism worked for only short periods during August, even though efforts to fix it were made by several people. No useful photocell records were obtained. The recording mechanism is being shipped back to the G. E. Research Laboratory at Schenectady for repairs."

With the cessation of financial support from the General Electric Co., the Observatory will continue to make routine counts of freezing nuclei as long as possible, if the necessary equipment belonging to the General Electric Co. is left at Mount Washington. Upon request, carbon copies of the log of observations will be made and forwarded monthly to G. E.

Very truly yours,

Wallace E. Howell

WALLACE E. HOWELL
Director

WEH/w

2 Divinity Avenue
Cambridge 38, Mass.
July 15, 1949

Purchasing Department
Research Laboratory
General Electric Company
Schenectady 5, New York

PDG-8451
F.M.Veeder/Fraenckel
Bldg. 5, Door 6

to

Mount Washington Observatory
Gorham, New Hampshire

.....

For services and materials, as directed by
Dr. Vincent J. Schaefer, during the month
of June 1949 ..... $700.00

WALLACE E. HOWELL, Director

2 Divinity Avenue
Cambridge 38, Massachusetts

May 16, 1950

Dr. Vincent J. Schaefer
Research Laboratory
General Electric Company
Schenectady, New York

PDR-51154
J.Bermel/Schaefer

to

Mount Washington Observatory
Gorham, New Hampshire

For services of observers making sublimation nuclei counts during the month of April 1950, as ordered, 60¼ hrs. @ $3.00 per hr. $180.75

duplicate file

OK VJS
May 18 '50

3045821

2 Divinity Avenue
Cambridge 38, Mass.
August 9, 1949

Purchasing Department
Research Laboratory
General Electric Company
Schenectady 5, New York

PDC-8451
F.M.Veeder/Fraenckel
Bldg. 5, Door 6

to

Mount Washington Observatory
Gorham, New Hampshire

.....

For services and materials, as directed by
Dr. Vincent J. Scheafer, during the month
of July 1949 ..... $700.00

WALLACE E. HOWELL, Director

2 Divinity Avenue
Cambridge 38, Mass.
September 6, 1949

Purchasing Department
Research Laboratory
General Electric Company
Schenectady 5, New York

PDC-8451
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For services and materials, as directed by Dr. Vincent J. Schaefer, during the month of August 1949 ..... $700.00

WALLACE E. HOWELL, Director

Titles of several photos of Flights # 52+53.

1. A view of the gamma seeding about 25 minutes after seeding with dry ice at rate of 1.3 pound per mile. November 24, 1948. Morning flight. Project CIRRUS. One B-17.

2. A view at the junction of the two legs of the gamma seeding pattern.

November 24, 1948. Morning Flight. Project CIRRUS. One B-17.

3. A view along one leg of the gamma seeding. This lane was 20 miles long and several miles wide. November 24, 1948. Morning flight. Project CIRRUS. One B-17.

4. Sun pillar and sun dog observed in the modified area of the gamma seeding. It is believed that this is the first "reflected sun dog" photograph ever taken. November 24, 1948. Morning flight. Project CIRRUS. One B-17.

5. View along leg of gamma seeding. November 24, 1948. Morning flight. Project CIRRUS. One B-17.

6. A portion of the hole in a solid overcast which was produced by seeding with dry ice at rate of about 1.3 pound per mile. Note the many fields and wooded areas visible through the area. November 24, 1948. Morning flight. Project CIRRUS. One B-17.

7. The modified area in a solid overcast immediately after seeding after the plane had climbed above to obtain photographs.

November 24, 1948. Afternoon flight. Project CIRRUS. One B-17.

8. Distant view of "race track" pattern showing end on view of the 20 mile legs of the seeded path. November 24, 1948. Afternoon flight. Project CIRRUS. One B-17.

9. A near view of the "race track" showing the twenty mile legs and the circular island produced.

November 24, 1948. Afternoon flight. Project CIRRUS. One B-17.

10. The area at the end of the "race track" showing an interesting development which occurred here. The hole free of cloud developed in this region. November 24, 1948. Afternoon flight. Project CIRRUS. One B-17.

[Flights 52 & 53]

11. View of ground through a hole produced by the "race track" seeding pattern. Very poor illumination of the ground below the adjacent solid overcast prevented obtaining a good picture. November 24, 1948. Afternoon flight. One B-17.

Syracuse Herald-Journal 12/3/48

Rainmaking Produces Odd Legal Problems

PALO ALTO, Calif. (AP)—Doing more than just talking about the weather can get you in trouble with the law, says the "Stanford Law Review."

The "Review" discusses the legal pitfalls that may await the cloud-seeders and rainmakers. The article goes clear back to Justinian for hints of "Who owns a cloud?"

The rub is that nobody in particular owns a cloud, and everybody in general, because of a cloud's "vague and elusive nature."

IT APPEARS that you cannot lasso a cloud, like a horse, nor can you paint it green, like a house. You cannot "occupy" it, legally speaking, because it might move on and you'd just be sitting there.

Therefore you cannot own a cloud as an individual any more than you can own the air, the ocean, or wild life.

However, if you are a farmer dependent upon rainfall for the use of your land, and if someone seeds a cloud over your land and it blows over somebody's land and it rains, then there may be a case for damages.

BUT THIS IS not simple, says the "Review" as it warms to the technicalities of the subject.

You, as the outraged farmer, would have to prove:

ONE: That rainmaking is possible in the first place.

TWO: That the accused actually made it rain in this case.

THREE: That his rainmaking robbed you of rain and gave it to somebody else.

None of these would be easy to prove today due to lack of legal precedent, but the writer thinks it will become easier as the general knowledge of rainmaking increases.

THE ARTICLE, written after recent U. S. weather bureau tests with rainmaking, says that it is a "natural" for government regulation, as "it is vitally important to the nation as a whole and action by one individual may affect many others."

"Legislation regulating most phases of rainmaking will be essential when it becomes economically useful," the article predicts.

Meanwhile rainmakers seem to be taking no chances, the article notes. "Many lawyers have been consulted . . . General Electric confined its experiments to the laboratory because of the almost limitless damage that might result from a man-made cloudburst. Small-town rainmakers, who fly for local farmers, are usually very secretive about when and where they fly to make rain."

COURT DECISIONS in various states may not always be the same because of different laws on the control of water and the rights of individuals to use water, even though the laws as written obviously were not considering water as it came directly from clouds.

"In most jurisdictions, however, the landowner stands an excellent chance of establishing a right to water in clouds," the article concludes.

Dr J. S. Marshall
W. M. Palmer
K.L.S. Gunn
W. Hitschfeld
M. Bloom

Prof J.S. Marshall
Physics Building
McGill University
Montreal, Que.

.040 ~~mg~~ gm / cubic meter at 5 miles

5 miles — 0.01 cubic miles

R. Hoomer Norris.
Campbell Ave Race Track Bldg 3

2419

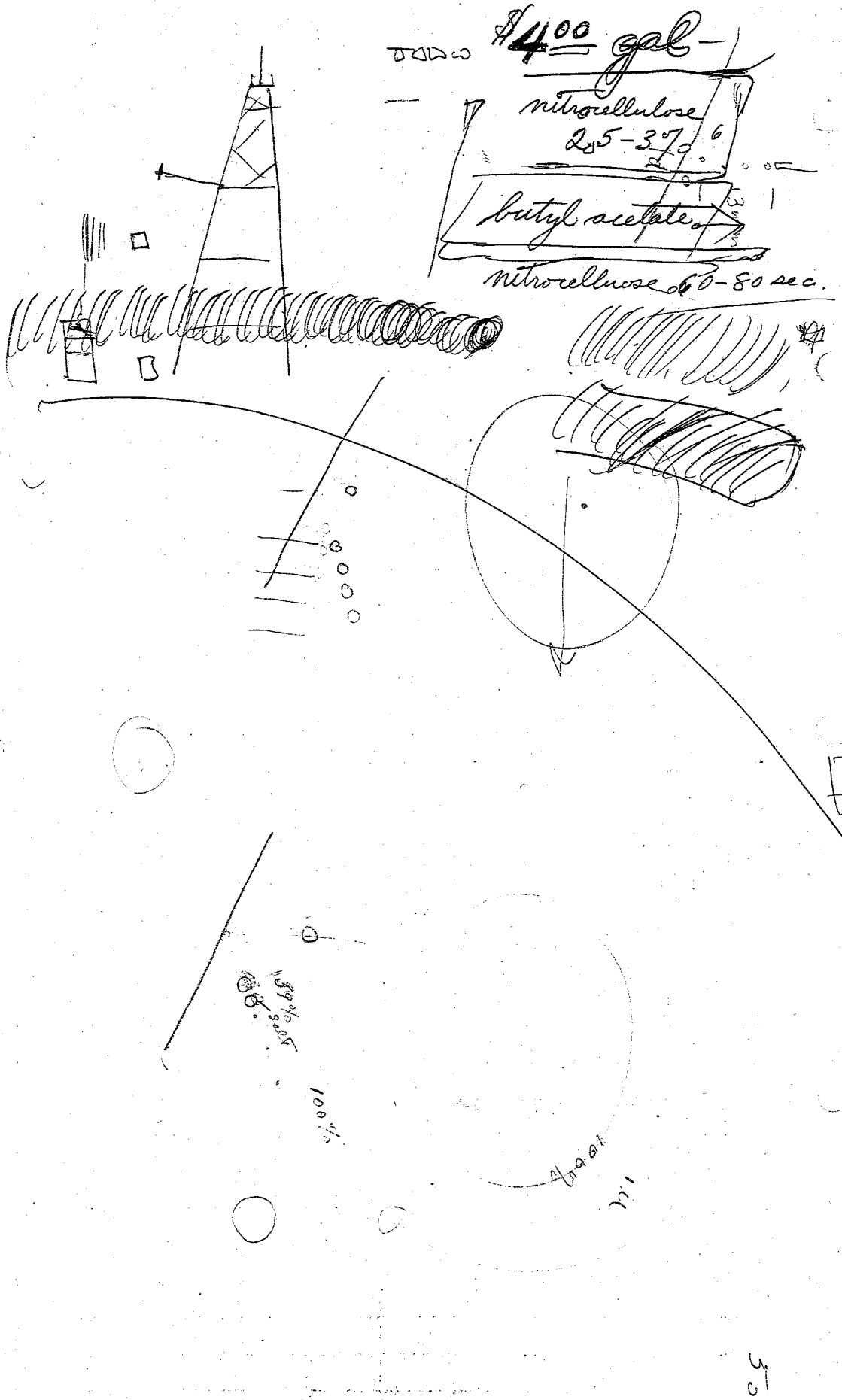
~~X-22~~ 60 miles above White Sands

800,000 square miles

200 photos 1½ sec intervals.

Aerobees 1400 miles length upper Wyoming to deep Mexico

Width 45 - 400 miles at horizons


$4.00 gal
nitrocellulose
2.5-3.7 c.
butyl acetate
nitrocellulose 60-80 sec.

f/sec	f	feet	dist	light	subject
64	2.8	5	18"	1 pfg fl	stream of cut $AgNO_3$
16	2.8	5	18"	"	" "
16	2.8	15	18		" " "
64	2.8	8	18		" 1 "

		reel exposed ft	dist		
16	2.0 Pol 1	0	18"	1 pfg fl.	[illegible]
16	2.0 Pol 1 20	20	18"	"	
16	2.0 Pol 1 30				larger quantity
16	2.0 Pol 1 40				still larger quantity

film off spool spoiled

16 2.0 Pol 1 0

25 25 18" 1 pfg fl [illegible] best

Should use ~~pfg~~ photo flood SK

1/25 5.6 Pol ↕ 5xx 5 stills

118.5 cc/sec

10 min	1.640 G	0.164 G/min
20 min	3.040 G	0.152 G/min
80 min	12.614 G	0.1574 G/min [ave]

Average value 0.158 G/min or 0.00263 G/sec

So that 0.00263 G in 118.5 cc

$$118.5 \overline{)\,0.00263000}\quad = .000022$$

2370
2600
2370

0.000022 G/cc

or **22 G/M³**

& C G

Gordon

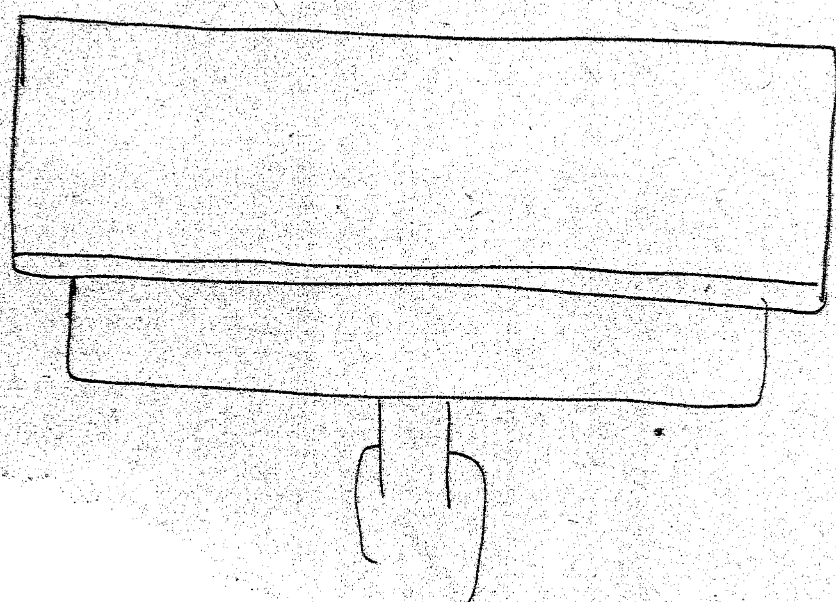
4206
3687

3373

Get illuminator

Call A-2

Tom Quay

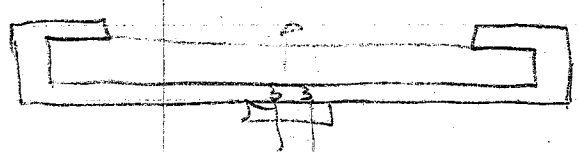


210°F thruout day

3/2/48 All 6 sec exp 180mm tube 6x oc 48 obj

1 1212
2 1216P
3 1220
4 1231
5 1240
6 1242
7 1251 210°F
8 1255 noul
9 1257 in silicone oil
10 107P
11 1:10P • #2
12 1:11P #1

1 145P #3
2 147P #2 formvar
3 150P formvar
4 435P #3
5 525 silicone oil start
6 635P #4
7 730P #1
8 810P
9 811P #5 Thin cell silicone
10 813P #6 silicone oil PS
11 110P
12 110PM



Biographical Directory of American Men of Science

BOX 749

LANCASTER,

PENNSYLVANIA

DEC 13 1948

Critique of Flight 52

1. Photo panel and airgraph should be used from take off until landing
2. More meteorological data is going up and down. On way up or on way down plane should level off to fly at constant altitude at intervals of 2000 feet long enough to make meteorologist to get reliable wet bulb readings. Especially readings should be taken just below the cloud (stratus) and just above. There is usually an inversion just above a stratus cloud. This should be explored by getting three points along at grazing cloud tops at about 200 ft. above top and about 400 ft above. At these levels photograph the shadow of the plane in the clouds.

When there are two planes the lead plane outside did receding should continue to make temp measurements just above the cloud level and should fly down in the center of the seeded area getting temperatures at various levels down to that of the top of

DEC 13 1948 (2

the descending snow also take photographs of the shadow of the plane (glory). in the falling snow
2. on the top of the unmodified stratus
~~3. Object, is to determine the height of the top of the falling s~~
3. In a car the new clouds which form (later) in the seeded groove.

Object. 1 Determine rate of fall of the snow. 2 Determine temperature of the air at various levels within the clear air above the falling snow. into the groove
3. Determine the size of the crystals by the ~~corona~~ glory ~~shadow~~ (circles surrounding the shadow of the plane) Colored ~~photos~~ photos for the glory ~~are particularly good~~

When the groove opens up sufficiently the lower plane should try fly down there or under the falling snow ~~to~~ and observe and photograph
1 the sun column below or above level of the horizon
2. The ~~sun~~ true sun dogs (colored) at same level as sun but 20° to the right of it.
3. The Reflected sun dogs ± 20° to right or left of the sun column ie, same angle below the horizon that the sun is above it

4. The time ~~to~~ 22° Halo around the sun note brilliance of the colors and seen (one or 2 rings of red)

5. Look to see if a Reflected 22° Halo can be seen

6 Look to see if a 46° Halo can be seen around the sun

7 be on the look out for other rarer types of haloes (a horizontal horizon line all the way around above the horizon

---

Object I obtain this by learning about the haloes and their changes with time after reading I am may be able to determine the shapes and sizes of the crystals formed by reading Besides the three things are beautiful to look at!

When the needed track begins to show holes thru which the ground can be seen the photographer should take some pictures with 5 to 20 times longer exposure than are normally used in photographing the clouds. This to bring out details of the ground. These photos

can be taken but when a run is back of the photographs so that the run shines down thru the hole and illuminates the ground that is being photographed.

The Controllers report for Flight 52 is perfect. Only suggestion is that reading Times (start and end) should be given within seconds not to the nearest minute.

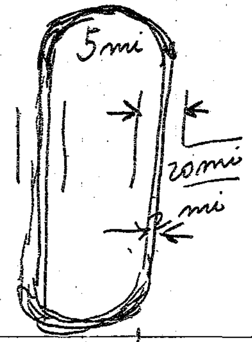
Position of the plane with respect to the ground should be given (when ground can be seen through hole) with precision (not just on Boston) and times within seconds. Also is it not possible to read times at which radio ranges are covered. These data will be very valuable in determining the winds at various altitudes. When ground can be seen I would like a drift determination made with the plane a few hundred feet above the level of the treetops for there is often a strong cross wind there at this level.

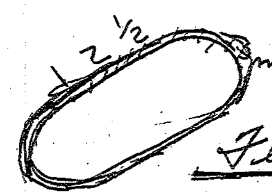
DEC 13 1949

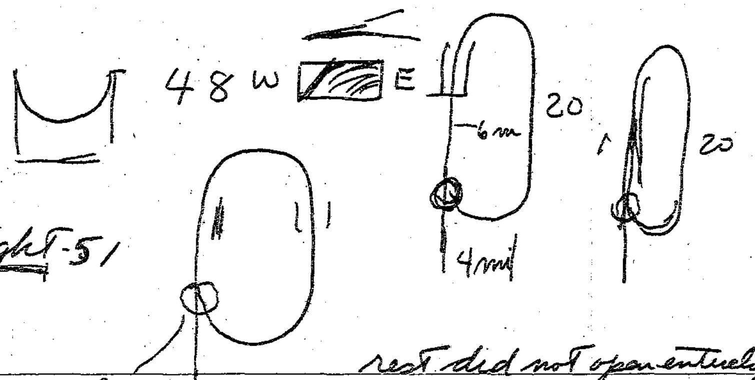
5

Many Photographs of Flight 52 are very poor - What is the cause ~~poor~~ Is the trouble in the fixing & or development of the prints or is it in the & negative. Many photos show definite geometrical shaped shadows (same shape but different position in successive photos). ~~Are~~ ~~Ex.~~ These are evidently in the negative what is the cause? reflections from the plexiglass or dirt on it?

Turner to







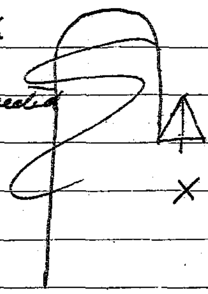
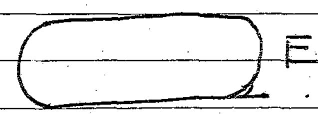
Flight-51

rest did not open entirely

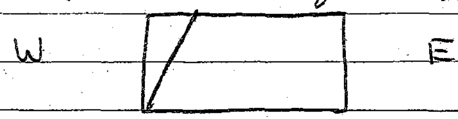
| 6mi | Oval rectangle hole opened

After 1 hr 1½ rest filled in except for hole

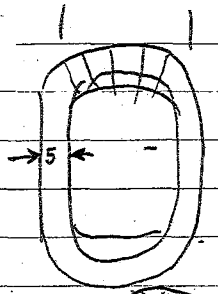
Clouds ca 2000 feet thick
~~Temp -4° base 5000~~ uncorrected
~~-3° Tops 7500~~
~~+1 6500~~
~~-1 6500 above~~

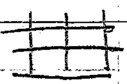



west side sharp filled in from E to West



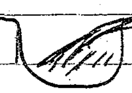
2000 ft. thick.
sun pillar - halos



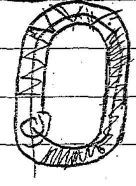


same structure as before

Called Rome did not pick up returns but saw snow falling from

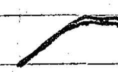


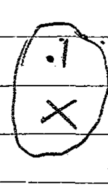
53 with Speed Graphic
1 color
movie film quite a lot



.1 on West Paralell

3 drops X o





½" 1#
x x

#.1 about ¾ x 1 mile in 20 min
1 particle

saw all three no photos

let down thru clouds over Rome Air base saw 3 holes with long trails of Virga

1# dimmest
other 2 nearly equal

1# drop not falling as much as .1# falling best snow to ground

8000 feet – 7900"

Temp –5°C

indicated 13000 feet – 12800

correct air speet

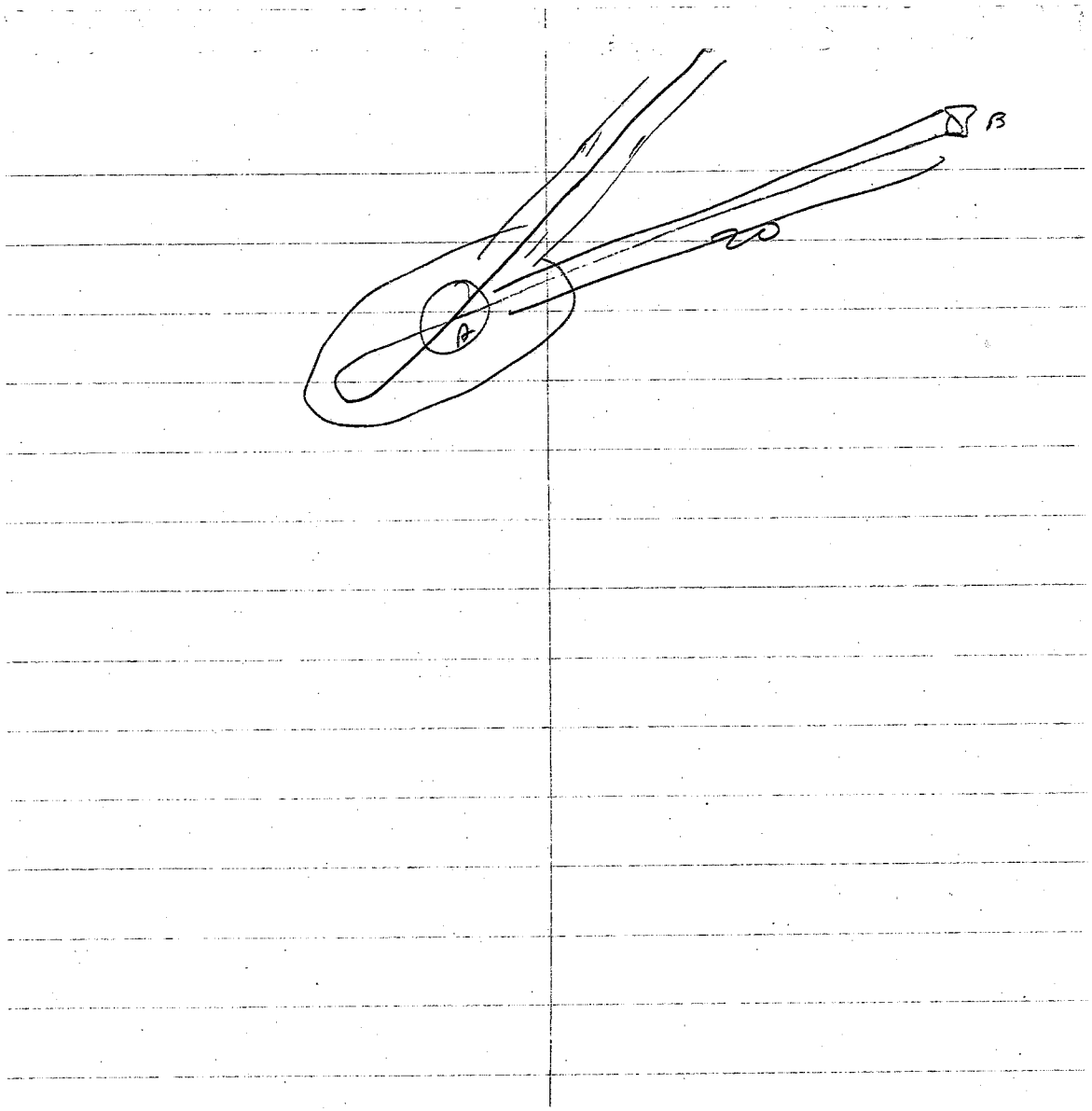
8000 ft –5°C 170mi – 190.5

7900 ft. 170mi – 190.0

No 270908

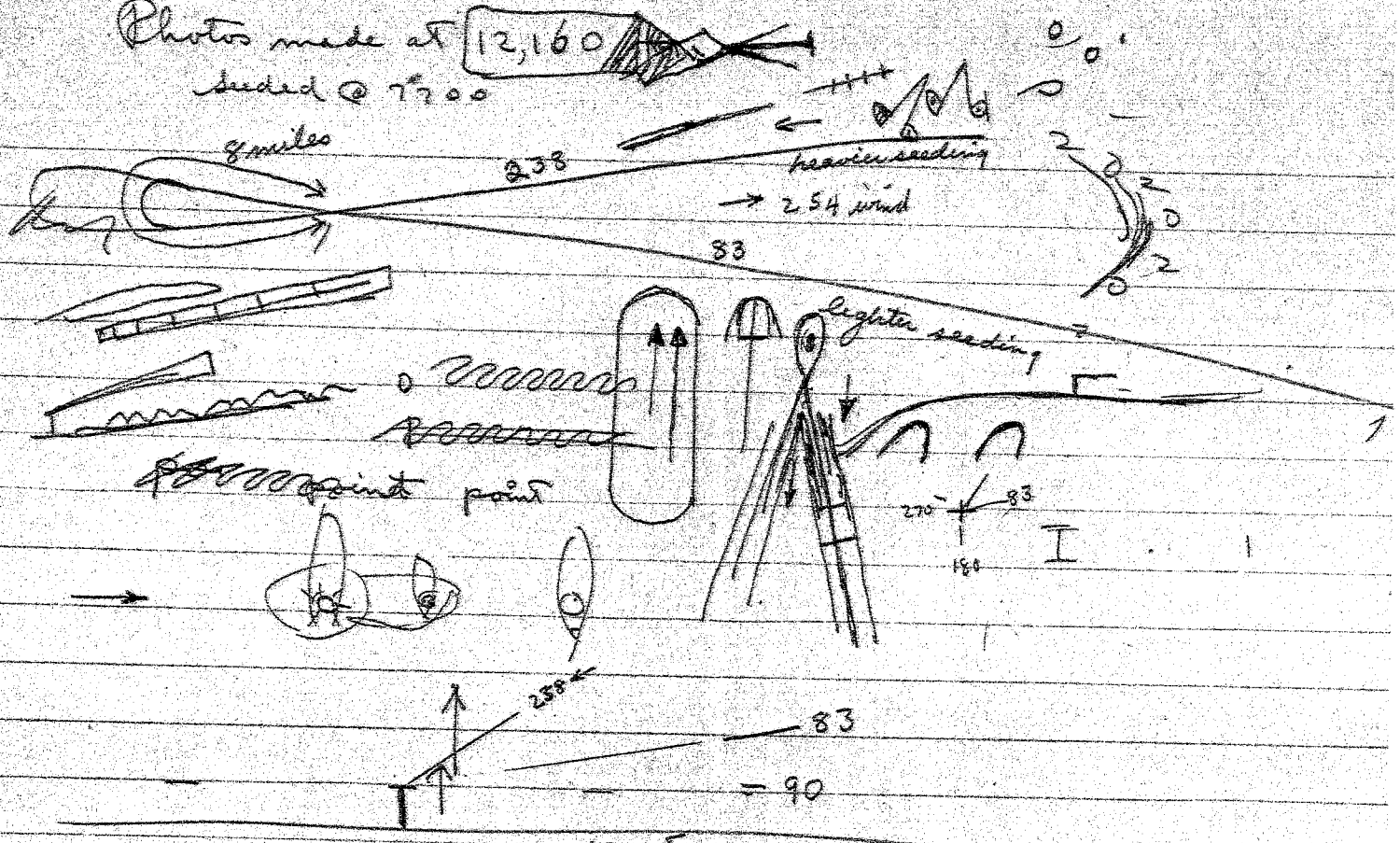
Express 12/7/4

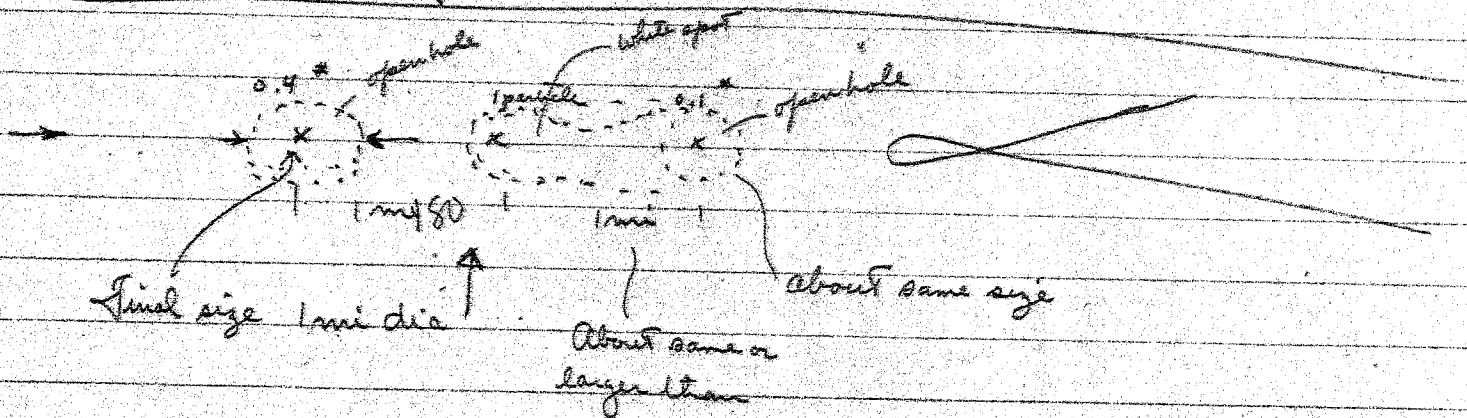
~~Westfield~~ No


A
B

Photos made at 12,160

seeded @ 7,200





1st drop 9 53 37

1st + third same size 10:10 17 mi

2nd very weak

10:13:15 photo

10 14 20 "middle hole" merging with 1st hole

V slight seeing on windshield ?

Time calculations Flight 52

~~4107~~ 35 47
2828
721
420
21

5
36 62
28 28
7 34
420
34
454

68
37 23
28 28
8 55
480
55
535

37 58
28 28
9 30
60
540
30

69
38 09
28 28
9 41
540
41

38 59
28 28
10 31

631

38 68
28 28
10 40

39 55
28 28
11 27

60
11
60
00

640

660
27

39
40 63
28 28
11 35

660
35

40 30
28 28
12 2
6

4327
4201
126

40 81
28 28
12 53
60
780
53
993

722

86
813
899

40
41 87
28 28
12 59
60
720
59
779

41 50
28 28
13 22
60
780
22
802

4425
4201
224

4201

813

4150
4226
24

4226
4201
25
813
838

4513
4201
312
180

4243
4201
42
813
855

192
813
1005

42 61
28 28
13 33
6
780
33
813

4516

4516
4201
315
180
195
813
1008

120
24
144
813
957

4917
4201
716
60
420
436
813
1249

4723
4201
5 22

4905
4201
704

53
17
36

4639
4201
438
813
240
38
1091

4814
4201
613
360
13

813
373
1186

300
322
813
1135

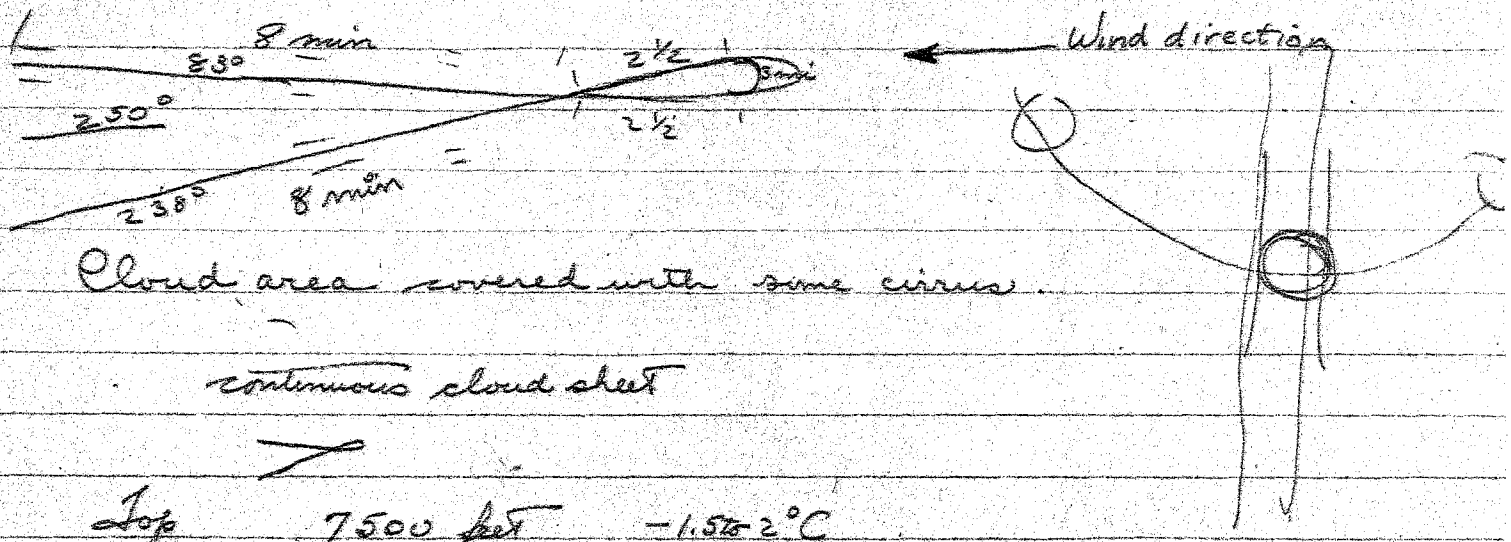
60
424
813
1237

11/24/48 1:40

Photos with K-25 100 photos.

Time of seeding ~~start~~ 0834

Wind direction — 254 @ 0856 29.5 knots



Cloud area covered with some cirrus.

continuous cloud sheet

Top 7500 feet −1.5 to 2°C

Base 6000 feet −1°C uncorrected

1500 feet

Top flat with inversion probably at 8000.

Seeding rate hand job. > 2 bags with ½ left

Length of leg 20 mile. 48 miles

−1°C at 5000

−6.7C at 7500

increasing slowly 7760 −1.5°, 0.8° 0.9° } Uncorrected dry.

−1.3 @ 9000

−4.3 11100

−5.6 12600

Glory on outside clouds.

Seeded at 834

over Crested at 934

Syracuse Herald-Journal 11/20/48

Dr. Schaefer Of GE Makes Real Snow

THERE IS PROBABLY but one man who lives to see snow as much as children do.

That person is Dr. V. J. Schaefer of the General Electric research laboratory at Schenectady. He makes the fluffy stuff.

Speaking last night before Technology Club members in the Museum of Fine Arts, Dr. Schaefer denied it was he who brought yesterday's first real snow of the season, but inferred he could probably do just as good a job.

DR. SHAEFER told the group he likes snow because he finds genuine beauty in it. He does not ski but spends as much time up in the clouds as he does in the laboratory carrying on his experiments.

He is used to temperatures of 39 degrees below zero and generally encounters this degree while cruising in the stratosphere and substratosphere in an Army B-29, hunting the right type of clouds to create a snowfall.

"I HAVE produced some snow but don't want to be known as a snowmaker. I deal in experimental meteorology," Dr. Schafer said.

He told the group he feels very lenient toward forecasters because of the years of his own experience. He said he finds the weather a very tricky subject.

"One tiny little thing lake dust entering a cloud," he said, "may produce things we can't understand."

DR. SCHAEFER is the man who amazed the world when he sowed a cloud with particles of dry ice and created a snowfall. He said he is now experimenting with silver iodide.

F. M. Deerhake, chairman of the sponsoring chapter of the Institute of Radio Engineers, introduced Dr. Schaefer as the first person who ever did something to control the wearth. Charles B. Spase presided.

HqAMC Form No. 10-513 (Rev 1 Aug 46)

SAVE U.S. ARMY CONSERVATION PROGRAM

HEADQUARTERS

AIR MATERIEL COMMAND

MCREOC31/ECT/erw

IN REPLY ADDRESS BOTH COMMUNICATION AND ENVELOPE TO COMMANDING GENERAL, AIR MATERIEL COMMAND, ATTENTION FOLLOWING OFFICE SYMBOL:

MCREOC

WRIGHT FIELD, DAYTON, OHIO

3 DEC 1948

General Electric Company
1 River Road
Schenectady 5, New York

ATTN: V. V. Schaefer

Attached is a rough draft copy of the ANC-22 Bulletin, "Climatic and Environmental Criteria for Aircraft Design." Your comments regarding technical accuracy, additional bibliography, and any suggestions for improvement are invited. In the event that illustrations or photographs of the various factors of climate and environment or of the effect of these factors on various types of equipment are available, copies would be appreciated.

Comments and illustrative material must be received by this office within 60 days of the above date to be considered for inclusion in the "printer's copy" of the ANC-22 Bulletin. Should data be available which cannot be provided within the 60 days specified, correspondence regarding delay and the approximate date of transmittal should be furnished.

E. C. Theiss

E. C. THEISS
Chairman, ANC-22 Panel
Aircraft Committee
Munitions Board

Incl
As stated

4201

(813)

11 450
7 590
4 340

Time calculations Flight 52
195

4950	5040	5051	5221	5311	5322	5351	5412
4201	4201	4201	4201	4201	4201	4201	4201
749	839	850	1020	1110	1121	1150	1211
420	480	480	600	660	660	660	720
49	39	50	20	10	21	50	11
813	813	813	813	813	813	813	813
1282	1332	1348	1433	1483	1494	1523	1549

5430	5436	5506	5519	5607	5628	5709
4201	4201	4201	4201	4201	4201	4201
1229	1235	1305	1318	1406	1427	1508
720	720	780	780	840	840	900
29	35	05	18	26	27	08
813	813	813	813	813	813	813
1562	1568	1598	1611	1659	1680	1721

5746	5840	5930	5942	6015	6101	6112
4201	4201	4201	4201	4201	4201	4201
1545	1639	1729	1741	1814	1900	1911
900	960	1020	1020	1080	1140	1140
45	39	29	41	14	00	11
813	813	813	813	813	813	813
1758	1812	1862	1874	1907	1959	1964

(1953)

112	142	233	324	326	410	419	433
0101	0101	0101	0104	0104	0101	0101	0101
11	41	131	223	225	309	318	332
1953	1953	1953	1953	1953	1953	1953	1953
1964	1994	60	120	120	180	180	180
		2044	2096	2098	2142	2451	2165

451	505	536	547	622	708	736	756	837
101	101	101	101	101	101	101	101	101
350	44	435	446	521	607	635	655	736
180	240	240	240	300	360	360	360	420
1953	1953	1953	1953	1953	1953	1953	1953	1953
2183	2197	2328	2239	2274	2320	2348	2368	2409

906	919
101	101
805	818
480	480
1953	1953
2438	2451

08 08 79
08,28,28
4051
60
2400
51

APPARATUS DEPARTMENT

GENERAL ELECTRIC

SUBJECT

COPIES:

Boston, October 1, 1951

Dr. B. Vonnegut
Research Laboratory
Schenectady Works

I want to thank you and Dr. Schaeffer for the excellent suggestions you gave me on possible icing detectors. The time you gave me is deeply appreciated.

Dr. Schaeffer asked for the schedule of the G.E. man on Mt. Washington this season. Please give him the following information:

The G.E. representative is Mr. C. R. Butler. His schedule is as follows:

September	27	to November 9
December	9	to December 19
January	3	to January 23
February	22	to April 1

Herbert Katz

Herbert Katz
Controls, Accessories and Mechanical Development
AGT-Boston, Tel. Ext. 61

HK:emb

REFERENCES TO HIGH WIND ON SUMMIT OF MT. WASHINGTON

"Handbook of Meteorology", Berry, Bollay, and Beers, McGraw Hill, (1945).
Page 972, Table 12, "Extremes of Some Climatic Elements Observed on Earth".

Absolute maximum wind
accurately measured ..... 225 m.p.h. ... Mt. Washington, N. H.

Maximum mean wind speed
accurately measured for 5 minutes ... 188 m.p.h. ... Mt. Washington, N. H.

/Note: For winds, the values given for Mt. Washington in the column for the U. S. extremes are the highest that are accurately measured at stations on the earth's surface. They are known to have been exceeded in the free atmosphere./

. . . . . .

Reference to the 188 m.p.h. value is also contained on page 800 of "The World Almanac" for 1951 under "Velocity of Winds in the United States".

2 Divinity Avenue
Cambridge 38, Mass.
February 28, 1950

Dr. Vincent J. Schaefer
Research Laboratory
General Electric Company
Schenectady, New York

to

Mount Washington Observatory, Inc.
Gorham, New Hampshire

For services of observers making sublimation nuclei counts during the month of January, as ordered, 60 hrs. @ $3.00 per hr..... $180.00

DKU 98 3/7/50