UNCLASSIFIED

AFCRL-62-259

14

GRD RESEARCH NOTES

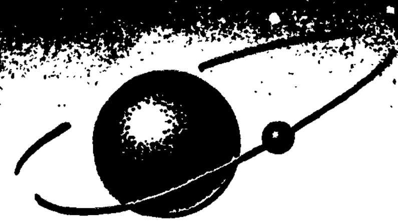
No. 79

A REVIEW OF STUDIES RELATING METEOROLOGICAL PARAMETERS TO SNOW CONDITIONS ON THE GREENLAND ICE CAP

L. S. Koenig
Major, USAF

February 1962

GRD



GEOPHYSICS RESEARCH DIRECTORATE
AIR FORCE CAMBRIDGE RESEARCH LABORATORIES
OFFICE OF AEROSPACE RESEARCH
UNITED STATES AIR FORCE
BEDFORD, MASSACHUSETTS

"GRD Research Notes are published as a medium for disseminating, in a relatively rapid and informal way, significant research results obtained in the course of a broader investigation, or interim information pending completion of a major research effort."

Requests for additional copies by Agencies of the Department of Defense, their contractors, and other government agencies should be directed to the:

Armed Services Technical Information Agency
Arlington Hall Station
Arlington 12, Virginia

Department of Defense contractors must be established for ASTIA services, or have their 'need-to-know' certified by the cognizant military agency of their project or contract.

All other persons and organizations should apply to the:

U. S. DEPARTMENT OF COMMERCE
OFFICE OF TECHNICAL SERVICES,
WASHINGTON 25, D. C.

AFCRL-62-259

GRD Research Notes
No. 79

A REVIEW OF STUDIES RELATING METEOROLOGICAL PARAMETERS TO SNOW CONDITIONS ON THE GREENLAND ICE CAP

L. S. Koenig
Major, USAF

February 1962

Project 8623
Task 86231

Terrestrial Sciences Laboratory
GEOPHYSICS RESEARCH DIRECTORATE
AIR FORCE CAMBRIDGE RESEARCH LABORATORIES
OFFICE OF AEROSPACE RESEARCH
UNITED STATES AIR FORCE
Bedford, Massachusetts

Abstract

Supply missions to Dew Line sites on the Greenland Ice Cap must land on unprepared landing strips. Although 6-hour weather observations are regularly received at Sondrestrom Air Base (the launch point), forecasting the surface conditions at these places poses special problems because site personnel make no snow observations. In the interests of flying safety a study was started to determine if snow surface conditions could be correlated with the reported weather conditions; but an intensive literature search yielded only meagre pertinent information. Sufficient correlation has been established to warrant further work, including the taking of snow and micrometeorological observations at the sites for a 1-year period and the reduction of this data so that reliable charts will be available to pilots who fly these or similar missions.

A REVIEW OF STUDIES RELATING METEOROLOGICAL PARAMETERS TO SNOW CONDITIONS ON THE GREENLAND ICE CAP

Introduction

To forecast surface conditions of snow cover on the Greenland Ice Cap it is necessary to know the nature of snow as it falls onto the surface and its subsequent metamorphism, the meteorological conditions during and after the snowfall, and the amount of snowfall. The problem is greatly simplified because only the area above the firn or melt zone of the Cap need be considered. There is a general increase of snow cover in the area from year to year so that a study of the snowfall and its metamorphosis during one year should yield some tentative conclusions; and further studies should refine these conclusions.

Snow

Snow is solid precipitation formed in the atmosphere by sublimation of water vapor onto solid minute nuclei.[2,3] Snow appears in many forms;[11] however, the following definitions are sufficient for the purposes of this paper:

1. Snow crystal – a single crystal of snow, either regular or irregular.
2. Snow particle – a combination of crystals of any orientation, grown up as a unit.
3. Snow flake – a cluster of snow crystals that have become stuck together while falling to earth.
4. Granular snow – opaque white grains, 1.0 to 5.0 mm in diameter, soft and frangible, often mixed with ordinary snow falling from cumuliform clouds.

For more information of forms of snow consult the literature.[1, 15]

The scant description of snow forms does not give much indication of conditions of fallen snow as a surface. Newly fallen snow usually settles in a loose layer.[11] The density and bearing strength of snow and its slipperiness are due in great part to the meteorological conditions at the time of fall and after deposition. Traffic or artificial modifications will not be considered because it is outside the scope of this study. Figure 1, however, compares cone index or shearing strength of fresh snow and compacted snow. In general, new snow will be loose and fluffy and of low density if it falls at generally low temperatures, around 14°F or lower; in a calm or very light wind condition; in the form of feathery flakes. Such snow frequently has a density in the neighborhood of 0.07 (Table 1). Snow

(Author's manuscript submitted for publication on 21 January 1962.)

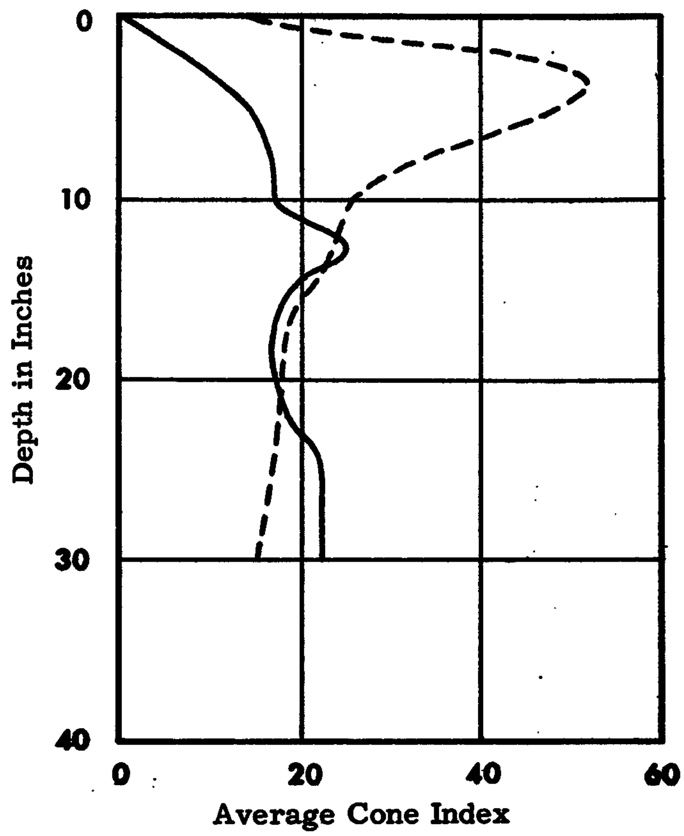


FIG. 1. Six-hour hardening vs virgin snow. Solid line: Virgin snow. Dashed line: Snow compacted by one pass each of D6 cat and M76 Otter with footprint pressures of 3.17 and 1.72 psi respectively. Average free air temperature during test: 21°F.[2]

TABLE 1. Density of new snow vs temperature.[11]

Mean daily temp. °C	Density gm/cc	Average gm/cc
T -10	0.01 - 0.23	0.075
-10 to -5	0.01 - 0.29	0.087
- 5 to -2	0.03 - 0.26	0.104
- 2 to 0	0.04 - 0.45	0.128
0 to +2	0.07 - 0.53	0.183

will be more dense if it falls at generally high temperatures, near 32°F, and/or with a wind condition of 15 to 20 kt or higher, and/or in granular form. Snow density depends most of all on the strength of winds at the time of fall. See Table 2. This increase in density occurs when the snow flakes have their feathery appendages knocked off by the tumbling action of the wind and by collision with other flakes, either in the air or on the ground. A finer-grained and, consequently, denser deposition results. The packing action of wind further increases the density.

TABLE 2. Density of snow vs wind speed during snowfall.[11]

Wind Condition		Density(gm/cc)
Calm	0 - 4 kt	0.04 - 0.07
Breeze	4 - 16 kt	0.04 - 0.13
Medium wnd	17 - 27 kt	0.12 - 0.18
Strong wnd	28 - 47 kt	0.15 - 0.22
Full Gale	48 - 55 kt	0.30 - 0.39

Metamorphism of Snow

Snow that is undisturbed by insolation, wind, liquid precipitation, or external mechanical forces will nevertheless undergo radical changes in form, density, and physical properties with time. This metamorphism has been studied and described by many authors.[1, 11, 14] The process results in a lower energy state for the snow and densification. There is also generally an increase in bearing strength. In the area under consideration, the average ambient air temperature seldom rises above freezing during the summer;[13] however, a certain amount of melting metamorphosis does take place in the top 2 to 5 inches of the snow surface as a result of insolation. This melting during the warmest period of the day is followed by a refreezing (crust formation) as the sun sets, or at low elevations of the sun. The density of the crust varies from 0.35 to 0.55 and generally has sufficient bearing strength for ski operations.

Snow is rarely disturbed by liquid precipitation at Dew Line east sites 2 and 3. Rain in any quantity will form a crust on the topmost layer in a very short time.

Aside from human activity, the only important factor that disturbs the snow on the Ice Cap is the wind. The new snow cover is considerably moved about by winds. Feathery and powdery snow is easily picked up and moved by winds over 5 kt. Figures 2 and 3 indicate the wind conditions that can be expected to occur. At wind speeds of 15 to 20 kt the snow will be picked up and blown in great enough amounts to reduce visibility and obscure the sky. At such times it is often impossible to distinguish between falling and blowing snow.[9] The sliding, tumbling action of snow particles as they are borne along by the winds results in the formation of smaller, denser, and harder snow particles which, when redeposited, form a much more compact surface whose hardness depends on the wind speed and time since deposition.[11, 14] A concomitant result of wind transport of snow, either new or old, is the formation of sastrugi (Table 3). The formation of

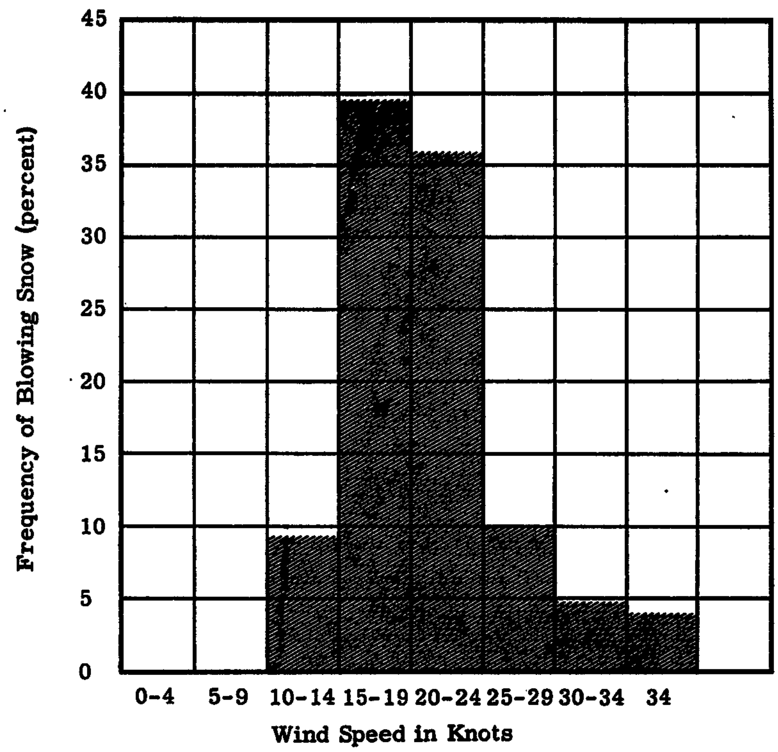


FIG. 2. Frequency of blowing snow on the Ice Cap above Melt Zone.[9]

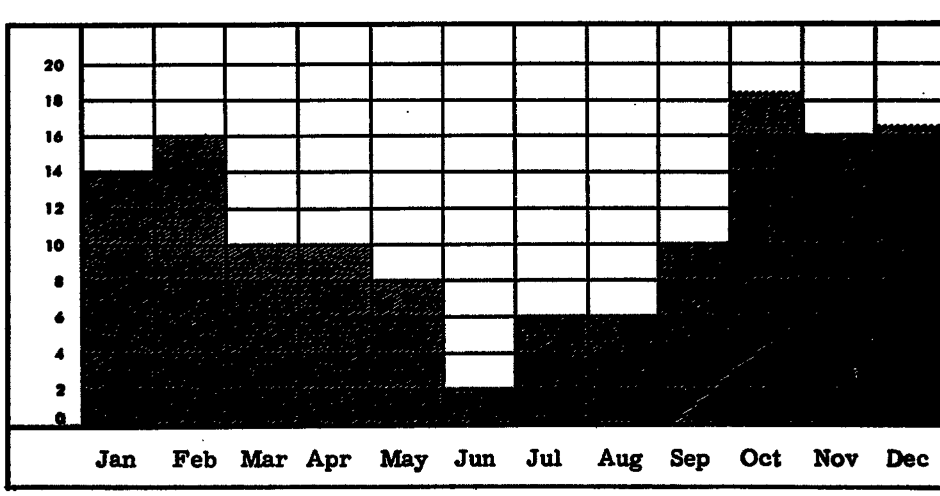


FIG. 3. Mean number of days of blowing snow each month on the Ice Cap above the Melt Zone.[9]

TABLE 3. Types of sastruga development in relation to wind velocity and precipitation.[7]

Wind velocity in knots Duration one day		Precipitation (Snow)			
		None; transported snow	Light (0-0.5'')	Medium (0.5-2'')	Heavy (2-5+'')
	Light 4-9kt	Small sheets	Small sheets	Large sheets	Diffused sheets
	Medium 10-15kt	Small barchans	Small barchans	Large barchans	Ragged barchans
	Strong 16-30kt	Linear ridges	Small linear ridges	Long linear ridges	Diffused linear ridges

different types of sastrugi is illustrated by the excellent photographs in ''Project Mint Julep.''[7] Disturbed snow almost always results in a harder surface which becomes still harder with aging.

During the height of summer heating (late June until the first week of August),[7] a certain amount of melting will take place. On a clear day this melting process stops because of radiational heat loss when the sun is low on the horizon. During periods with abnormally high temperatures (near 32°F) and overcast sky conditions, there will be considerable thawing action at this season due to the ''greenhouse effect'' in which the the cloud layer keeps the long-wave radiation trapped between the snow surface and the cloud base.

Summary

In general, the snow cover on the Ice Cap will not create great difficulties to ski operations for most of the year. During the early part of the winter, usually starting around the middle of August, the first snowfalls may be heavy, up to 12 inches or more of fluffy snow which resists compaction because it flows away from the skis like water.[3] A light fall of this snow usually does not present any undue difficulty.

In the later winter months when the ambient temperatures are always under 14°F the snow is generally drifted and packed by the winds during or after the snowfall (Figs. 2 and 3 and Table 3). Sastrugi constitute the most prominent difficulty during most of the year.[7] At the height of the summer the surface will occasionally be sticky, but this lasts at most only five or six hours in the middle of the day.

Recommendations

There is much literature on the snow and ice conditions on the Ice Cap; however, very little has been done to indicate the relationship of the weather conditions to the snow surface conditions. If snow surface conditions are to be forecast for safe ski operations using only weather reports from the landing area, more field investigations are needed. Such a forecast capability could also be used to forecast over-surface trafficability of self-propelled vehicles. To acquire this capability the following are recommended;

1. Standard weather observations at several sites on the Ice Cap for at least one year at each site. This is already being done in some places.

2. Snow measurements in the immediate area of the site where observations are being made. These measurements would be made using a cone penetrometer and a drop cone penetrometer in order to obtain the bearing strength of the surface and the shearing strength of the surface and the shearing strength of the top three feet of the snow cover.

3. Measurements of the rut depth made by aircraft landing on the unprepared snow surface near the area of observation. Note should be made of the type of aircraft, footprint pressure, and the pilot's remarks relative to the aircraft operation on the surface for landing and takeoff.

4. Reduction of the information gained in the three recommendations above arrive at charts and/or graphs that relate the surface condition to meteorological parameters and operational performance of aircraft.

Bibliography

1. H. Bader, et al, Der Schnee und Seine Metamorphose (Snow and its metamorphism), Beitrage zur Geologie der Schweiz, Geotechnische Serie, Hydrologie, Lieferung 3, Bern, 1939. USA SIPRE Translation 14 (1954).

2. "Trafficability of Snow, Report No. 3, Greenland Studies 1955 and 1957," Technical Memorandum 3-414, Waterways Experiment Station, Corps of Engineers, U.S. Army, Vicksburg, Mississippi, (May 1960).

3. T. L. Thompson, Snow as it Affects Aircraft Ski Performance WADC Technical Report 53-154, Wright Air Development Center, Air Research and Development Command, USAF, Wright-Patterson Air Force Base, Ohio, (June 1953).

4. "Trafficability of Snow, Report No. 4, Tests on Subarctic Snow," Tecnnical Memorandum 3-414, Waterways Experiment Station, Corps of Engineers, U. S. Army, Vicksburg, Mississippi, (December 1960).

5. R. L. Schuster, Project Mint Julep, Investigations of a Smooth Ice Area of the Greenland Ice Cap, Part III., Snow Studies, U. S. Army Snow Ice and Permafrost Research Establishment, Corps of Engineers (USA SIPRE), Report 19, Wilmette, Illinois, 7 p. (October 1954).

6. "Project Mint Julep, Investigation of Smooth Ice Areas of the Greenland Ice Cap, Part I, Special Scientific Reports, Arctic, Desert, Tropic Information Center, Research Studies Institute, Air University, Maxwell Air Force Base, Alabama, (May 1955).

7. "Project Mint Julep, Investigation of Smooth Ice Areas of the Greenland Ice Cap, Part II, Special Scientific Reports, Arctic, Desert, Tropic Information Center, Research Studies Institute, Air University, Maxwell Air Force Base, Alabama, (May 1955).

8. C. S. Benson, Physical Investigations on the Snow and Firn of Northwest Greenland, 1952, 1953, and 1954, U. S. Army Snow Ice and Permafrost Research Establishment, Corps of Engineers (USA SIPRE), Wilmette, Illinois, Research Report 26, 62p. (September 1959).

9. M. Diamond and R. W. Gerdel, Occurrence of Blowing Snow on the Greenland Ice Cap, Snow Ice and Permafrost Research Establishment, Corps of Engineers (USA SIPRE) Research Report 25, 5p. (April 1957).

10. "Aircraft Ski Landing Gear Development, WADC Technical Report 53-155, Wright Air Development Center, Air Research and Development Command, USAF, Wright-Patterson Air Force Base, Ohio, (September 1953).

11. G. D. Rikhter, Snezhnyi Pokrov, Ego Formirovanie I Svoistva, (Snow Cover, Its Formation and Properties), Izdatel'stvo Akademii Nauk SSSR, Moskva, 1945. SIPRE Translation No. 6, Snow Ice and Permafrost Research Establishment, Corps of Engineers, U.S. Army, Wilmette, Illinois, 76p. (August 1954).

12. "Interim Report to Snow Ice and Permafrost Research Establishment," SIPRE Report 1, Institute of Technology, University of Minnesota, 62p. (January 1950).

Bibliography (Continued)

13. M. Diamond, Air Temperature and Precipitation on the Greenland Ice Cap, U.S. Army Snow Ice and Permafrost Research Establishment, Corps of Engineers (USA SIPRE), Wilmette, Illinois, 9p. (October 1958).

14. W. D. Kingery, On the Metamorphism of Snow, Report of the International Geological Congress, XXI Session, Norden, pp. 81-89, (1960).

15. Glossary of Meteorology, R. E. Huschke, Ed., American Meteorological Society, (1959).

GRD RESEARCH NOTES

No. 1. Contributions to Stratospheric Meteorology, *edited by George Ohring, Aug 1958.*

No. 2. A Bibliography of the Electrically Exploded Wire Phenomenon, *W. G. Chace, Nov 1958.*

No. 3. Venting of Hot Gases Through Temperature Inversions, *M. A. Estoque, Dec 1958.*

No. 4. Some Characteristics of Turbulence at High Altitudes, *M. A. Estoque, Dec 1958.*

No. 5. The Temperature of an Object Above the Earth's Atmosphere, *Marden H. Seavey, Mar 1959.*

No. 6. The Rotor Flow in the Lee of Mountains, *Joachim Kuettner, Jan 1959.*

No. 7. The Effect of Sampler Spacing on Basic Analyses of Concentration Data, *Duane A. Haugen, Jan 1959.*

No. 8. Natural Aerosols and Nuclear Debris Studies, Progress Report I, *P. J. Drevinsky, C. E. Junge, I. H. Blifford, Jr., M. I. Kalkstein and E. A. Martell, Sep 1958.*

No. 9. Observations on Nickel-Bearing Cosmic Dust Collected in the Stratosphere, *Herman Yagoda, Mar 1959.*

No. 10. Radioactive Aggregates in the Stratosphere, *Herman Yagoda, Mar 1959.*

No. 11. Comments on the Ephemerides and Constants for a Total Eclipse of the Sun, *R. C. Cameron and E. R. Dyer, May 1959.*

No. 12. Numerical Experiments in Forecasting Air and Soil Temperature Profiles, *D. W. Stevens, Jun 1959.*

No. 13. Some Notes on the Correlation Coefficient, *S.M. Silverman, May 1959.*

No. 14. Proceedings of Military Geodesy Seminar, December 1958, Air Force Cambridge Research Center *(U), edited by O. W. Williams, Apr 1959. (SECRET Report)*

No. 15. Proceedings of the First Annual Arctic Planning Session, November 1958, *edited by Joseph H. Hartshorn, Apr 1959.*

No. 16. Processes for the Production and Removal of Electrons and Negative Ions in Gases, *S.M. Silverman, Jun 1959.*

No. 17. The Approximate Analysis of Zero Lift Trajectories, *Charles Hoult, Aug 1959.*

No. 18. Infrared Measuring Program 1958 (IRMP 58) – Activities, Achievements, and Appraisal *(U), M.R. Nagel, Jul 1959. (SECRET Report)*

No. 19. Artificial Radioactivity from Nuclear Tests up to November 1958, *E. A. Martell, Sep 1959*

No. 20. A Preliminary Report on a Boundary Layer Numerical Experiment, *M.A. Estoque, Oct 1959.*

No. 21. Recent Advances in Contrail Suppression, *(U), S. J. Birstein, Nov 1959. (CONFIDENTIAL Report)*

No. 22. A Note Comparing One Kilometer Vertical Wind Shears Derived from Simultaneous AN/GMD-1A and AN/GMD-2 Winds Aloft Observations, *H. A. Salmela and N. Sissenwine, Oct 1959.*

No. 23. Atmospheric Refraction of Infrared Radiation, *T. P. Condron, Oct 1959.*

No. 24. Natural Aerosols and Nuclear Debris Studies, Progress Report II, *M. I. Kalkstein, P. J. Drevinsky, E. A. Martell, C. W. Chagnon, J. E. Manson, and C. E. Junge, Nov 1959.*

No. 25. Observations of Jupiter Missile Re-Entry, *(U), R. G. Walker, R. E. Ellis and R. E. Hunter, Dec 1959. (SECRET Report)*

No. 26. Space Probes and Persistence of Strong Tropopause Level Winds, *H. Salmela and N. Sissenwine, Dec 1959.*

No. 27. A Relativistic Treatment of Strong Shock Waves in a Classical Gas, *A. W. Guess, Dec 1959.*

No. 28. Measurements of Flux of Small Extraterrestrial Particles, *H. A. Cohen, Jan 1960.*

No. 29. Proceedings of the Second Annual Arctic Planning Session, October 1959, *edited by Vivian C. Bushnell, Dec 1959.*

No. 30. Atmospheric Pressure Pulse Measurements, *(U), Elisabeth F. Iliff, Jan 1960. (SECRET Report – Formerly Restricted Data)*

GRD RESEARCH NOTES (Continued)

No. 31. A Discussion of the Calder Equation for Diffusion from a Continuous Point Source, *W. P. Elliott, May 1960.*

No. 32. Lagrangian and Eulerian Relationships in the Absence of Both Homogeneity and Time Steadiness, *M. L. Barad and D. A. Haugen, May 1960.*

No. 33. Thermal Radiation from Rocket Exhausts at Extreme Altitudes, *(U) R. G. Walker, R. E. Hunter, and J. T. Neu, Jun 1960. (SECRET Report)*

No. 34. Thermal Radiation Measurement from an Aerobee Hi Research Rocket, *R. G. Walker, and R. E. Hunter, Dec 1960.*

No. 35. Additional Note — Strong Vertical Wind Profiles and Upper-Level Maximum Wind Speeds Over Vandenberg Air Force Base, *H. A. Salmela and N. Sissenwine, May 1960.*

No. 36. Contributions to Satellite Meteorology, Vol. I., *edited by W. K. Widger, Jr., Jun 1960.* Vol. II., *edited by F. R. Valovcin, Apr 1961.*

No. 37. IRMP Participation in Operation Big Arm — Activities, Results and Appraisal *(U), Final Report, M. R. Nagel, et al, Jun 1960. (SECRET Report)*

No. 38. Examples of Project Tiros Data and Their Practical Meteorological Use, *W. K. Widger, Jr., July 1960.*

No. 39. Exploration of the Ionosphere with Telemetering Monochromators and Retarding Potential Analyzers, *H. E. Hinteregger, Aug 1960.*

No. 40. Proceedings of the Second Annual AFCRC Seminar on Military Geodesy, *edited by T. E. Wirtanen, (SECRET Report) Nov 1960.*

No. 41. Tangential Velocity Measurements – An Independent Approach to Geodesy, *B. C. Murray and N. H. Dieter, Sep 1960.*

No. 42. Topographic Charts at One-Degree Intersections for the Entire Earth, *L. Berkofsky and E. A. Bertoni, Sep 1960.*

No. 43. Cosmic-Ray Monitoring of the Manned Stratolab Balloon Flights, *Herman Yagoda, Sep 1960.*

No. 44. Methods for the Evaluation of the Green's Function Arising in the Linear Barotropic Numerical Weather Prediction Theory, *L. Berkofsky, Nov 1960.*

No. 45. Observation of Thor Missile Re-entry, *(U) R. Ellis, Oct 1960. (SECRET Report)*

No. 46. Background Measurements During the Infrared Measuring Program 1956 (IRMP 56) (Unclassified excerpts from the proceedings of the symposium on IRMP-56), *edited by Max R. Nagel, Nov 1960.*

No. 47. Wind Speeds from GMD-1 Ascents Computed Electronically Compared to Plotting Board Results, *H. A. Salmela, Oct 1960.*

No. 48. The Numerical Solution of Fredholm Integral Equations of the First Kind, *J. T. Jefferies and F. Q. Orrall, Nov 1960.*

No. 49. Infrared Spectra of High Altitude Missile Plumes, *(U), Lt. R. E. Hunter, Jan 1961. (SECRET Report)*

No. 50. Aids for Computing Stratospheric Moisture, *Murray Gutnick, Jan 1961.*

No. 51. Some Applications of the Method of Least Squares to Estimating the Probability of a Future Event, *I. A. Lund, Jan 1961.*

No. 52. Winds and Circulations in the Mesosphere, *T. J. Keegan, Feb 1961.*

No. 53. Gravity Observations Along the Northern Coast of Ellesmere Island, *F. A. Crowley, Feb 1961.*

No. 54. Radiation Studies from Nuclear Emulsions and Metallic Components Recovered from Polar Satellite Orbits, *H. Yagoda, Mar 1961.*

No. 55. Proceedings of the Third Annual Arctic Planning Session, November 1960, *edited by G. Rigsby and V. Bushnell, April 1961.*

No. 56. Horizontal Sounding Balloon Feasibility Study *Maj. T. Spalding and S. B. Solot, May 1961.*

No. 57. Instability and Vertical Motions in the Jet Stream, *J. P. Kuettner and G. S. McLean, May 1961.*

No. 58. A Study of Sacramento Peak Flares II: Flare Areas and Importance Classifications, *(to be published).*

No. 59. A Study of Sacramento Peak Flares I: Distribution, Areas, and Growth Curves, *H. J. Smith, April 1961.*

No. 60. Hourly Rawinsondes for a Week, *A. Court and H. A. Salmela, July 1961.*

No. 61. New Vacuum Ultraviolet Emission Continua in the Rare Gases, *R. E. Huffman, W. W. Hunt, Y. Tanaka, R. L. Novak, and J. C. Larrabee, July 1961.*

No. 62. Bibliography of Lunar and Planetary Research - 1960 (With Annotations), *J. W. Salisbury and L. T. Salisbury, Jul 1961.*

No. 63. Flight Information and Experimental Results of Inflatable Falling Sphere System for Measuring Upper-Air Density, *G. A. Faucher, R. W. Procunier and C. N. Stark, Aug 61.*

No. 64. Maximum Winds and Missile Responses, *H. A. Salmela and A. Court, Aug 61.*

No. 65. Meteorological Evaluation and Application of Rainfall Radioactivity Data, *Per B. Storebø, Aug 1961.*

No. 66. The Formation of Ions in the Upper Atmosphere, *R. E. Huffman, (to be published).*

No. 67. Studies in Lunar Topography, *Zdenek Kopal, (to be published).*

No. 68. An Example of Chromospheric Striation Obscuration by a Great Flare, *H. J. Smith and W. D. Booton, Aug 61.*

No. 69. A Numerical Method for Computing Radiative Temperature Changes Near the Earth's Surface, *W. P. Elliott and D. W. Stevens, Sep 61.*

No. 70. Location of a Lunar Base, *J. W. Salisbury and C. F. Campen, Jr., (to be published).*

No. 71. Micrometeorite Collection from a Recoverable Sounding Rocket, *R. K. Soberman, et al, (to be published).*

No. 72. Micrometeorite Measurements from the Midas II, (1960 Zeta 1) Satellite, *R. K. Soberman and L. Della Lucca, Nov 61.*

AF Cambridge Research Laboratories, Bedford, Mass. Geophysics Research Directorate
A REVIEW OF STUDIES RELATING METEOROLOGICAL PARAMETERS TO SNOW CONDITIONS ON THE GREENLAND ICE CAP, by L.S. Koenig, Major, USAF. February 1962. 8 pp. incl. illus. (GRD Research Notes No. 79; AFCRL-62-259)
Unclassified report

Supply missions to Dew Line sites on the Greenland Ice Cap must land on unprepared landing strips. Although 6-hour weather observations are regularly received at Sondrestrom Air Base (the launch point), forecasting the surface conditions at these places poses special problems because site personnel make no snow observations. In the interests of flying safety a study was started to determine if snow surface conditions could be correlated with the reported weather conditions; but an intensive literature search yielded only meagre pertinent information. Sufficient correlation has been established to warrant further work, including the taking of snow and
(over)

UNCLASSIFIED

1. Arctic Regions
2. Snow
3. Meteorological Parameters
4. Landing Fields

I. Koenig, L.S.

UNCLASSIFIED

AF Cambridge Research Laboratories, Bedford, Mass. Geophysics Research Directorate
A REVIEW OF STUDIES RELATING METEOROLOGICAL PARAMETERS TO SNOW CONDITIONS ON THE GREENLAND ICE CAP, by L.S. Koenig, Major, USAF. February 1962. 8 pp. incl. illus. (GRD Research Notes No. 79; AFCRL-62-259)
Unclassified report

Supply missions to Dew Line sites on the Greenland Ice Cap must land on unprepared landing strips. Although 6-hour weather observations are regularly received at Sondrestrom Air Base (the launch point), forecasting the surface conditions at these places poses special problems because site personnel make no snow observations. In the interests of flying safety a study was started to determine if snow surface conditions could be correlated with the reported weather conditions; but an intensive literature search yielded only meagre pertinent information. Sufficient correlation has been established to warrant further work, including the taking of snow and
(over)

UNCLASSIFIED

1. Arctic Regions
2. Snow
3. Meteorological Parameters
4. Landing Fields

I. Koenig, L.S.

UNCLASSIFIED

AF Cambridge Research Laboratories, Bedford, Mass. Geophysics Research Directorate
A REVIEW OF STUDIES RELATING METEOROLOGICAL PARAMETERS TO SNOW CONDITIONS ON THE GREENLAND ICE CAP, by L.S. Koenig, Major, USAF. February 1962. 8 pp. incl. illus. (GRD Research Notes No. 79; AFCRL-62-259)
Unclassified report

Supply missions to Dew Line sites on the Greenland Ice Cap must land on unprepared landing strips. Although 6-hour weather observations are regularly received at Sondrestrom Air Base (the launch point), forecasting the surface conditions at these places poses special problems because site personnel make no snow observations. In the interests of flying safety a study was started to determine if snow surface conditions could be correlated with the reported weather conditions; but an intensive literature search yielded only meagre pertinent information. Sufficient correlation has been established to warrant further work, including the taking of snow and
(over)

UNCLASSIFIED

1. Arctic Regions
2. Snow
3. Meteorological Pafameters
4. Landing Fields

I. Koenig, L.S.

UNCLASSIFIED

AF Cambridge Research Laboratories, Bedford, Mass. Geophysics Research Directorate
A REVIEW OF STUDIES RELATING METEOROLOGICAL PARAMETERS TO SNOW CONDITIONS ON THE GREENLAND ICE CAP, by L.S. Koenig, Major, USAF. February 1962. 8 pp. incl. illus. (GRD Research Notes No. 79; AFCRL-62-259)
Unclassified report

Supply missions to Dew Line sites on the Greenland Ice Cap must land on unprepared landing strips. Although 6-hour weather observations are regularly received at Sondrestrom Air Base (the launch point), forecasting the surface conditions at these places poses special problems because site personnel make no snow observations. In the interests of flying safety a study was started to determine if snow surface conditions could be correlated with the reported weather conditions; but an intensive literature search yielded only meagre pertinent information. Sufficient correlation has been established to warrant further work, including the taking of snow and
(over)

UNCLASSIFIED

1. Arctic Regions
2. Snow
3. Meteorological Parameters
4. Landing Fields

I. Koenig, L.S.

UNCLASSIFIED

UNCLASSIFIED

micrometeorological observations at the sites for a 1-year period and the reduction of this data so that reliable charts will be available to pilots who fly these or similar missions.

UNCLASSIFIED

UNCLASSIFIED

micrometeorological observations at the sites for a 1-year period and the reduction of this data so that reliable charts will be available to pilots who fly these or similar missions.

UNCLASSIFIED

UNCLASSIFIED

micrometeorological observations at the sites for a 1-year period and the reduction of this data so that reliable charts will be available to pilots who fly these or similar missions.

UNCLASSIFIED

UNCLASSIFIED

micrometeorological observations at the sites for a 1-year period and the reduction of this data so that reliable charts will be available to pilots who fly these or similar missions.

UNCLASSIFIED