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This report presents daytime atmospheric optical data collected chiefly with airborne instruments during a field expedition to northern Europe in the Winter of 1978. Results from 26 flights are presented. The data include the natural irradiance upon horizontal plane surfaces, total volume scattering coefficients, and derived values of atmospheric beam transmittance and equivalent attenuation length. Data for daytime conditions ranging from relatively clear and

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cloud free to completely overcast are presented. Data were measured in four spectral regions, as follows: Three narrow band optical filters with mean wavelengths of 478, 664, and 765 nanometers; and one broad band sensitivity representing a pseudo-photopic response with a mean wavelength of 557 nanometers.

Selected meteorological properties, measured concurrently with the radiometric data are also included.

AFGL-TR-79-0159 SIO Ref. 79-25

AIRBORNE MEASUREMENTS OF ATMOSPHERIC VOLUME SCATTERING COEFFICIENTS IN NORTHERN EUROPE, WINTER, 1978

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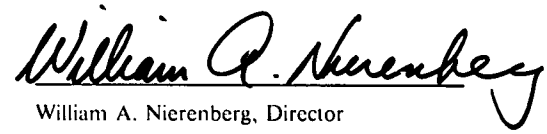

William A. Nierenberg, Director
Scripps Institution of Oceanography

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Major Ted S. Cress, Atmospheric Optics Branch, Optical Physics Division

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AIR FORCE GEOPHYSICS LABORATORY
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SUMMARY

This report, which describes portions of the Visibility Laboratory's Project OPAQUE IV* effort, was prepared under AFGL Contract F19628-78-C-0200. The principal project task was to take daytime atmospheric optical measurements in northern Europe and, from these measurements, to determine optical properties for various upward- and downward-inclined paths of sight. These properties include the natural irradiance upon horizontal plane surfaces, scalar irradiances, total volume scattering coefficients, atmospheric beam transmittances, path radiances, directional path reflectances, and directional sky and terrain reflectances. This report does not contain all of these optical properties, but in an effort to accelerate the availability of selected values, the data have been restricted to total volume scattering coefficients, atmospheric beam transmittances, and natural irradiances upon horizontal plane surfaces. The data base for the derivation of the additional, more directional optical properties is available on tape and can be exploited upon demand. Selected meteorological properties measured concurrently with the radiometric data are also included.

The OPAQUE IV field trip was made to northern Europe during January, February, March and April 1978. Data were recorded in six separate geographical regions - namely, off the western coast of Sicily, over northern and southern Germany, over southern England, in the Netherlands, and off the coast of southern Denmark. The daytime flight conditions for the 26 flights reported herein ranged from reasonably cloud free with moderate haze, to low ceilings with rain and snow.

The airborne radiometric instrumentation, developed at the Visibility Laboratory and mounted in Air Force C-130A Aircraft No. 50022, consisted of a total scattering meter (or integrating nephelometer) for determining the total volume scattering coefficient, two sky scanning radiometers for measuring upper and lower hemisphere (sky and terrain) radiances, a dual irradiometer for measuring alternately the downwelling and upwelling irradiances, an equilibrium radiance telephotometer, and a variable direction path function meter. The meteorological instrumentation included an absolute pressure transducer, a dewpoint hygrometer, and an AN/AMQ-17 aerograph for measuring ambient temperature and pressure.

A Visibility Laboratory ground based data station, equipped with a contrast reduction meter for determining earth-to-space beam transmittance and an integrating nephelometer for determining the ground level total volume scattering coefficient, was operational at four data sites. It was located at the Meppen OPAQUE site while the aircraft was operating in northern Germany, at the Birkhof OPAQUE site while the aircraft was in southern Germany, at the Trapani OPAQUE site while the aircraft was in Sicily, and at HMS Heron, Royal Naval Air Station, Yeovilton England while the aircraft was operating out of Mildenhall Air Base.

Each optical instrument was fitted with five optical filters causing it to measure at three narrow wavelength bands of the spectrum and two broad pass bands. The measurements were made using three narrow band filters at mean wavelengths of 478, 664, and 765 nanometers and a pseudo-photopic filter with a mean wavelength of 557 nanometers.

All primary data were recorded on magnetic tapes which were returned to the Visibility Laboratory for processing at the computer facilities of the University of California, San Diego.

*The project title OPAQUE IV has been assigned to this activity by the Air Force Geophysics Laboratory as a nickname for procedural identification only. It is not necessarily utilized or recognized by agencies or organizations outside of the participating USAF organizations and the Visibility Laboratory. The relationship between this activity and other similar OPAQUE related activities conducted by the Visibility Laboratory is illustrated in AFGL-TR-78-0286, Duntley, *et al.* (1978c).

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LIST OF ILLUSTRATIONS

RELATED CONTRACTS AND PUBLICATIONS

Related Contracts: None

Publications:

Duntley, S. Q., R. W. Johnson, and J. I. Gordon, "Airborne Measurements of Optical Atmospheric Properties in Southern Germany," AFCRL-72-0255, SIO Ref. 72-64 (July 1972).

Duntley, S. Q., R. W. Johnson, and J. I. Gordon, "Airborne and Ground-Based Measurements of Optical Atmospheric Properties in Central New Mexico," AFCRL-72-0461, SIO Ref. 72-71 (September 1972).

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Gordon, J. I., C. F. Edgerton, and S. Q. Duntley, "Signal-Light Nomogram," J. Opt. Soc. Am. 65, 111-118 (1975).

GLOSSARY AND NOTATION

The notation used in reports and journal articles produced by the Visibility Laboratory staff follows, in general, the rules set forth in pages 499 and 500, Duntley *et al.* (1957). These rules are:

Each optical property is indicated by a basic (parent) symbol.

A presubscript may be used with the parent symbol as an identifier, e.g., b indicates background while t denotes an object.

A postsubscript may be used to indicate the length of a path of sight, e.g., r denotes an *apparent* property as measured at the end of a path of sight of length r, while o denotes an *inherent* property based on the hypothetical concept of a photometer located at zero distance from an object.

A postsuperscript * or postsubscript $_*$, is employed as a mnemonic symbol signifying that the radiometric quantity has been generated by the scattering of ambient light reaching the path from all directions.

The parenthetical attachments to the parent symbol denote altitude and direction. The letter z indicates altitude in general; z_t is used to specify the altitude of an object. The direction of a path of sight is specified by the zenith angle θ and the azimuth ϕ. In the case of irradiances, the downwelling irradiance is designated by d, the upwelling by u.

The glossary for meteorological symbols is presented in Section 6.

$A(z)$ — Albedo at altitude z, defined by the equation $A(z) \equiv H(z,u)/H(z,d)$.

AGL — Above ground level.

$H(z,d)$ — Irradiance produced by downwelling flux as determined on a horizontal flat plate at altitude z. In this report d is used in place of the minus sign in the notation $H(z,-)$ which appears in Duntley (1969). This property may be defined by the equation

$$H(z,d) \equiv \int_{2\pi} N(z,\theta',\phi')\cos\theta' d\Omega'$$

$H(z,u)$ Irradiance produced by the upwelling flux as determined on a horizontal flat plane at altitude z. Here u is substituted for the plus sign formerly used in the notation $H(z,+)$.

$L(z)$ Attenuation length at altitude z. This property is the reciprocal of the attenuation coefficient, that is,

$$L(z) \equiv \alpha(z)^{-1}.$$

$\bar{L}(z)$ Equivalent attenuation length is defined as

$$\bar{L}(z) = \frac{-z}{\ln T_z(0,0)}.$$

$N(z,\theta,\phi)$ Radiance as determined from altitude z in the direction specified by zenith angle θ and azimuth ϕ.

${}_sP(t)$ Saturated vapor pressure at ambient temperature.

${}_sP({}_dt)$ Saturated vapor pressure at dewpoint or frostpoint temperature.

RH Relative humidity in percent $RH = [{}_sP({}_dt)/{}_sP(t)]100$

$R/M(0)$ Universal gas constant.

$\overline{S_\lambda T_\lambda}$ Standardized relative spectral response of filter/cathode combination where S_λ is spectral sensitivity of the multiplier phototube cathode and T_λ is spectral transmittance of optical filter.

$s(z)$ Total volume scattering coefficient as determined at altitude z. This property may be defined by the equation

$$s(z) \equiv \int_{4\pi} \sigma(z,\beta)\, d\Omega$$

In the absence of atmospheric absorption, the total volume scattering coefficent is numerically equal to the attenuation coefficient.

${}_Rs(z)$ Total volume scattering coefficient for Rayleigh scattering at altitude z.

t Ambient temperature °C.

${}_dt$ Dewpoint or frostpoint temperature, °C.

$T_r(z,\theta)$ Beam Transmittance as determined at altitude z for a path of sight of length r at zenith angle θ. This property is independent of azimuth in atmospheres having horizontal uniformity. It is always the same for the designated path of sight or its reciprocal.

VV	Visibility as estimated by the meteorologists $VV = 3/s(z)$.
z	Altitude, usually used as above ground level.
z_t	Altitude of an object.
$\alpha(z)$	Volume attenuation coefficient as determined at altitude z. In the absence of atmospheric absorption, the attenuation coefficient is numerically equal to the volume scattering coefficient.
β	Symbol for scattering angle of flux from a light source. It is equal to the angle between the line from the source to the observer and the path of sight.
Δ	Symbol to indicate incremental quantity and used with r and z to indicate small, discrete increments in path length r and altitude z.
δ_λ	Response area is defined as $\delta_\lambda = \sum(\overline{S_\lambda T_\lambda})\Delta\lambda$.
θ	Symbol for zenith angle. This symbol is usually used as one of two coordinates to specify the direction of a path of sight.
θ'	Symbol for zenith angle usually used as one of two coordinates to specify the direction of a discrete portion of the sky.
λ	Symbol for wavelength.
$\bar{\lambda}$	Mean wavelength is defined as $\bar{\lambda} \equiv \sum \lambda(\overline{S_\lambda T_\lambda})\Delta\lambda/\delta_\lambda$
$\rho(z)$	Density at altitude z.
σ	Symbol for volume scattering function. Parenthetical symbols may be added; for example, β may be used to designate the scattering angle from a source. In Gordon (1969) the parenthetical symbols are z and β for altitude and scattering angle.
$\sigma(z,\beta)/s(z)$	Proportional directional volume scattering function. This may be defined by the equation $\int_{4\pi}[\sigma(z,\beta)/s(z)]d\Omega \equiv 1.$
ϕ	Symbol for azimuth. The azimuth is the angle in the horizontal plane of the observer between a fixed point and the path of sight. The fixed point may be, for example, true north, the bearing of the sun, or the bearing of the moon. This symbol is usually used as one of two coordinates to specify the direction of a path of sight.

ϕ' This symbol for azimuth is usually used as one of two coordinates to specify the direction of a discrete portion of the sky.

Ω Symbol for solid angle.

For a hemisphere: $\Omega = 2\pi$ steradians;

For a sphere: $\Omega = 4\pi$ steradians.

1. INTRODUCTION

The field measurement program described in this report was organized under the project title OPAQUE IV (Optical Atmospheric Quantities in Europe). It was conducted during January, February and March 1978, to obtain data for case studies of the winter atmospheric optical properties over northern Europe.

The OPAQUE IV deployment was the fourth in a series that is planned to provide atmospheric optical data in several regions of northern Europe. These deployments are organized as a cooperative but independent effort associated with the NATO Research Study Group 8 of Panel IV, AC243. The OPAQUE IV deployment plan was specified in Air Force Geophysics Laboratory OPLAN for OPAQUE IV dated 15 November 1977.

The Visibility Laboratory, under the sponsorship of the Air Force Geophysics Laboratory has conducted a continuing program of experimental measurements documenting optical and meteorological properties of the lower atmosphere. These measurements and the computations related to their use are examples of a continuous effort to determine and apply quantitative as well as qualitative values to the atmospheric properties most affecting the performance of visual and/or electro-optical tasks within the troposphere.

The instrumental and computational organization for implementing those techniques related to the documentation of optical atmospheric properties is documented in several preceding reports. A recent example of these reports is AFGL-TR-76-0188, Duntley, *et al.* (1976).

This report, Scientific Report No. 10, has been prepared under Contract No. F19628-78-C-0200. It contains measured profiles of atmospheric volume scattering coefficient and downwelling irradiances between ground level and altitudes up to 6 kilometers. Computed values for vertical atmospheric beam transmittance and equivalent attenuation length are also presented for the same altitude interval. The measurements were made along the flight tracks illustrated in Figs. 1-1a, 1-1b, 1-1c, 1-1d, 1-1e, 1-1f, and 1-1g. Selected meteorological properties measured concurrently with the radiometric data are also included.

The methods used in the derivation and computation of the included optical properties are summarized in Section 2, and are similar to those presented in AFGL-TR-77-0078, Duntley, *et al.* (1977).

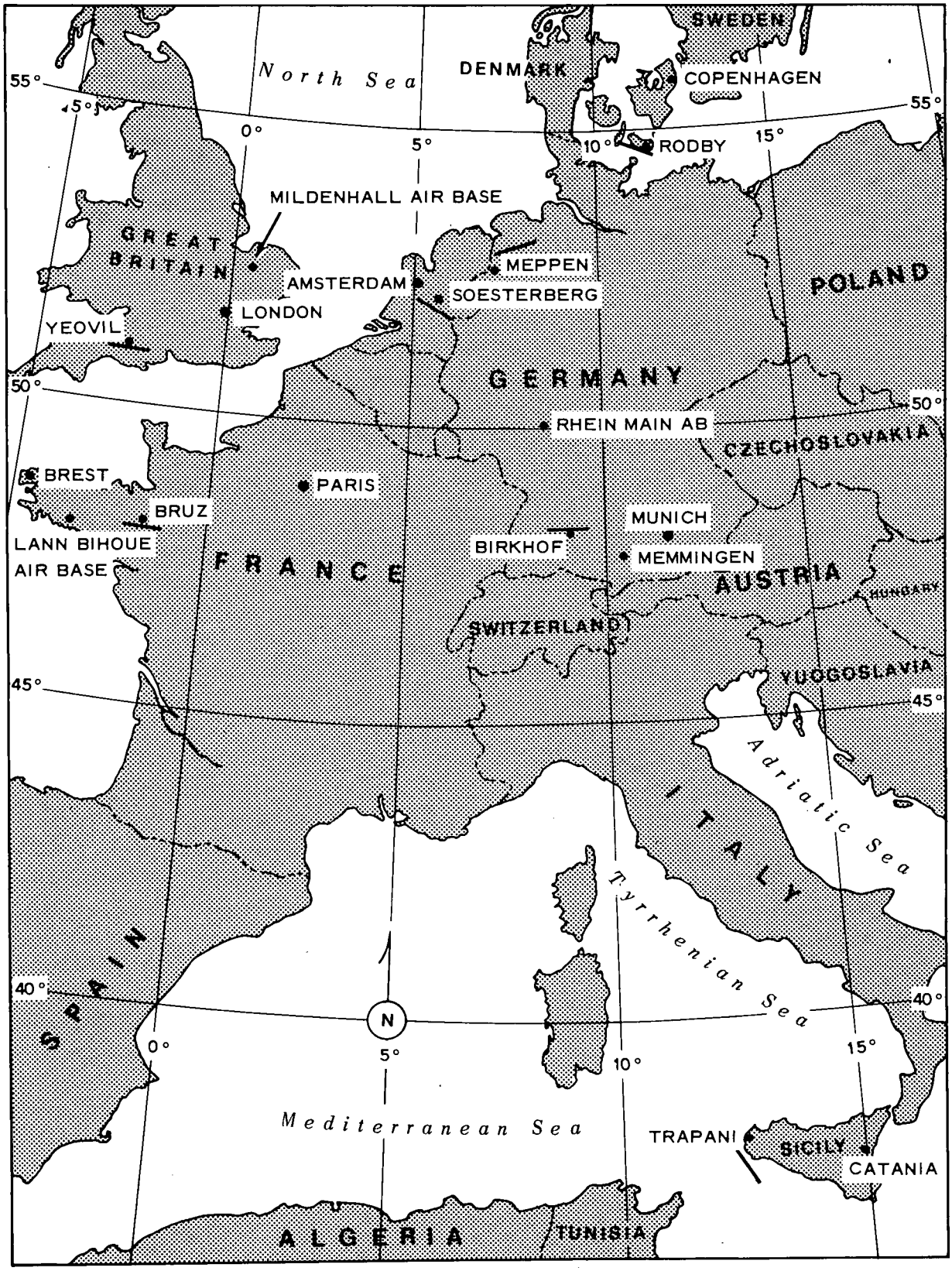


Fig. 1-1a. Typical OPAQUE Flight Tracks.

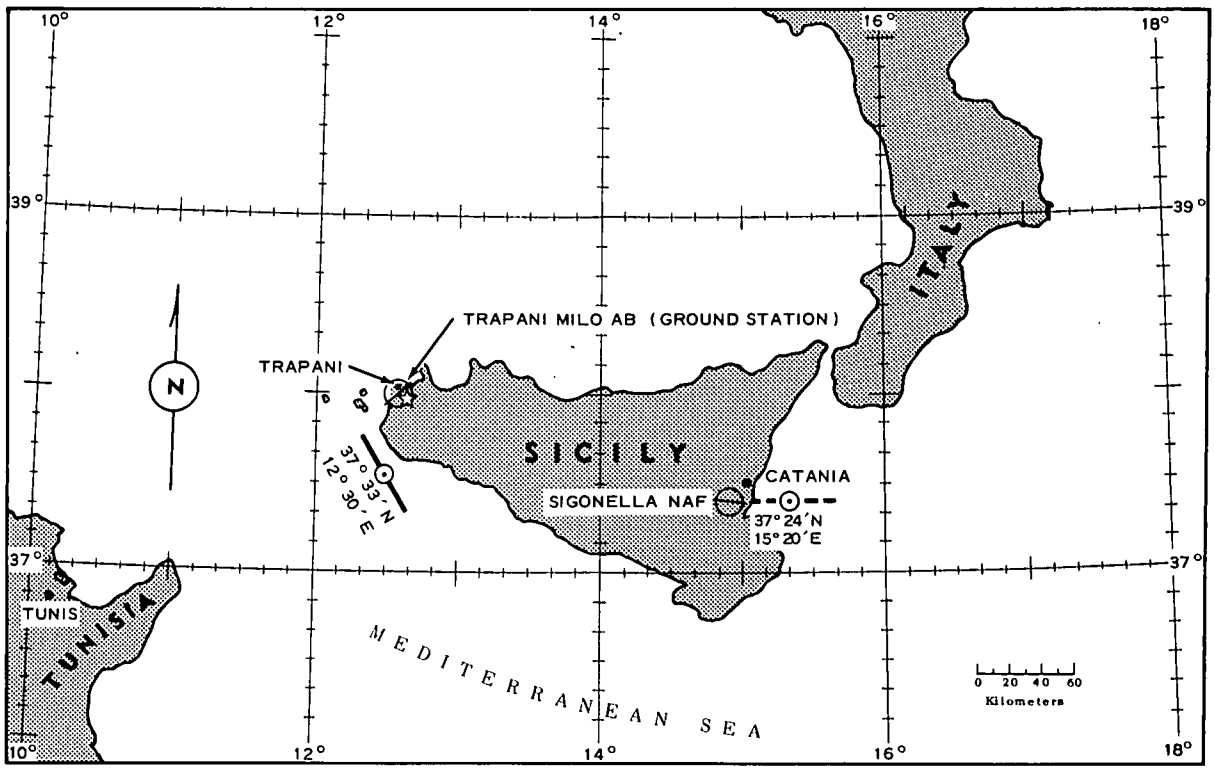


Fig. 1-1b. Typical Trapani Track and Data Sites, Detail Maps. Latitude and Longitude References are to Flight Track Center Point.

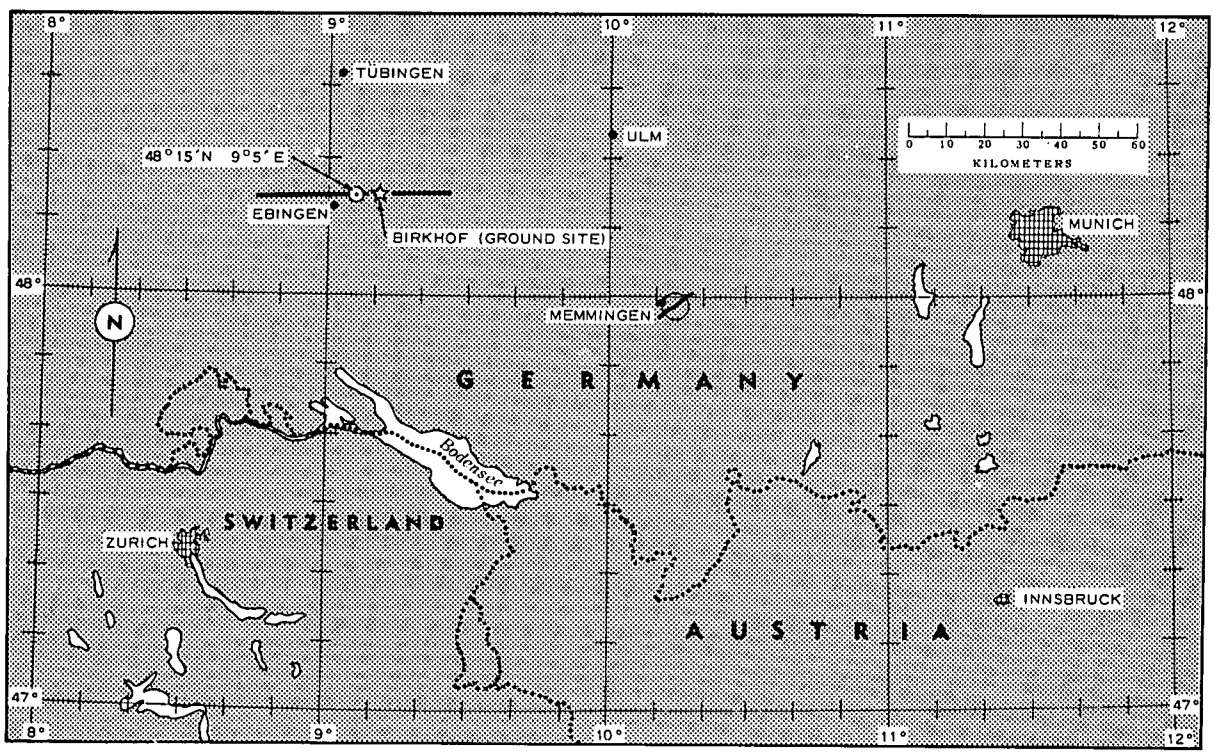


Fig. 1-1c. Typical Birkhof Track and Data Sites, Detail Maps. Latitude and Longitude References are to Flight Track Center Point.

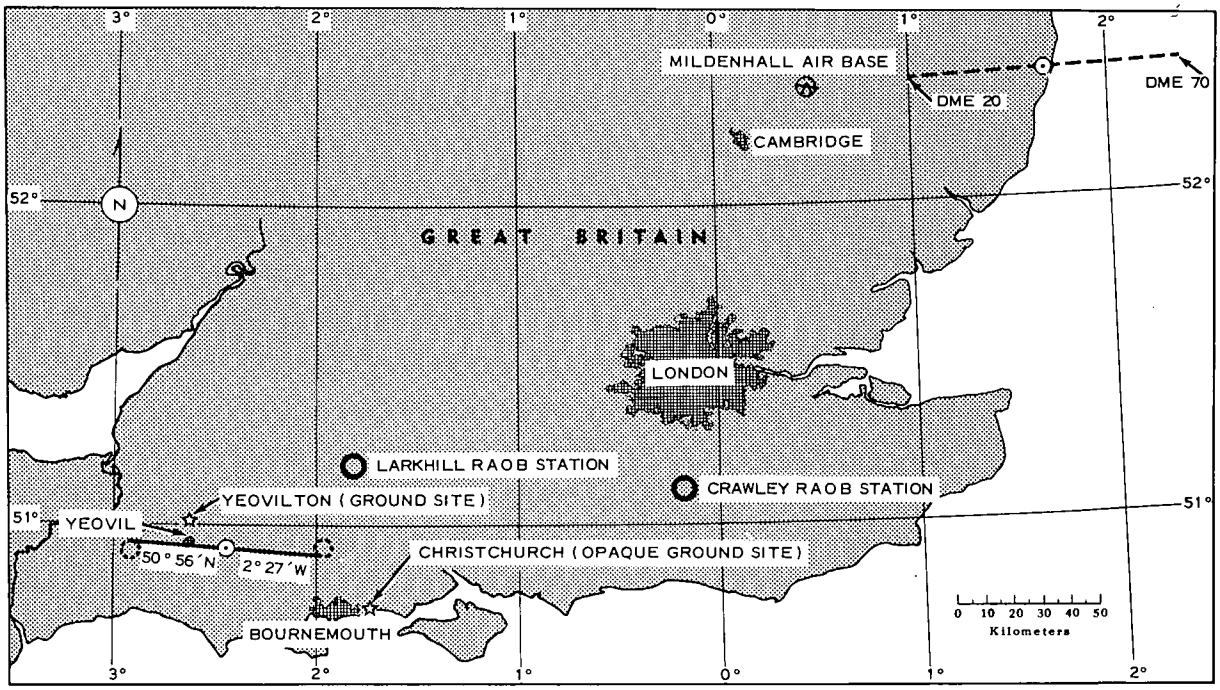


Fig. 1-1d. Typical Yeovil Track and Data Sites, Detail Maps. Latitude and Longitude References are to Flight Track Center Point.

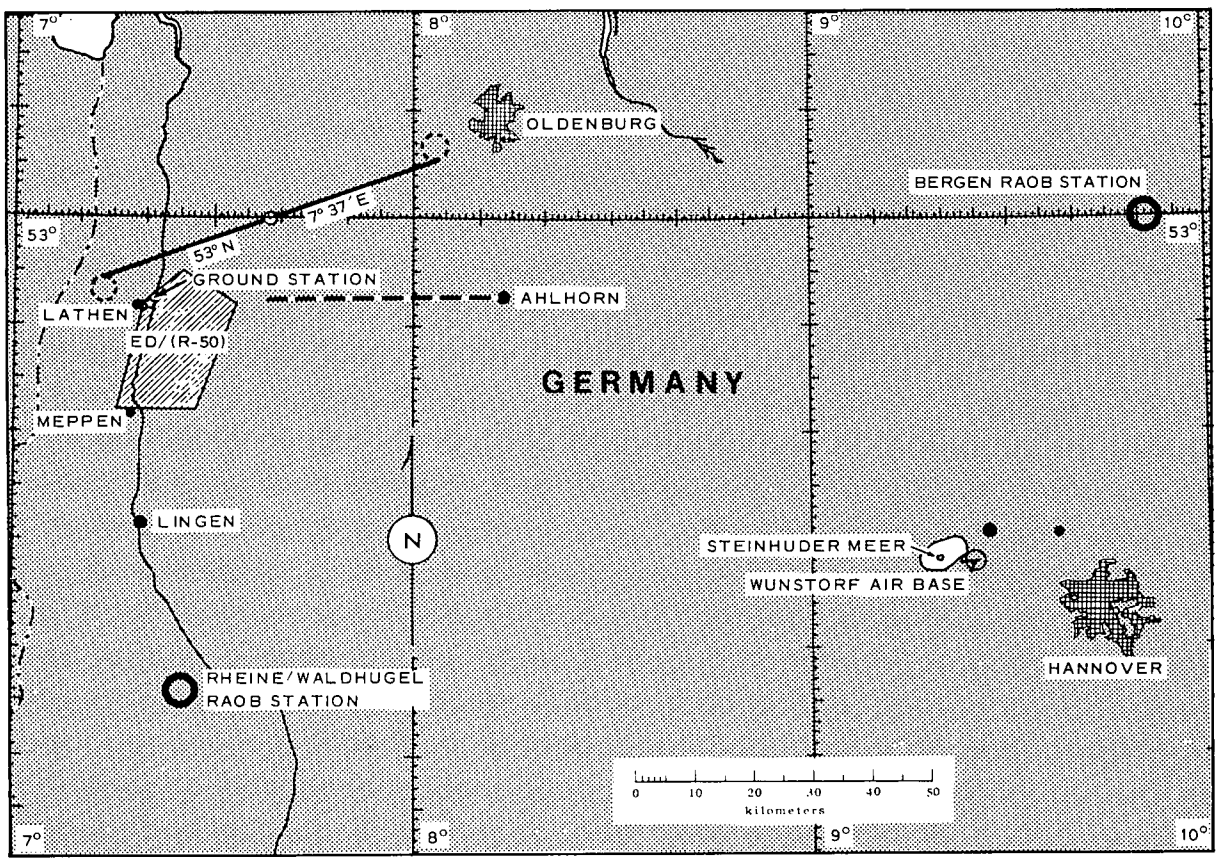


Fig. 1-1e. Typical Meppen Track and Data Sites, Detail Maps. Latitude and Longitude References are to Flight Track Center Point.

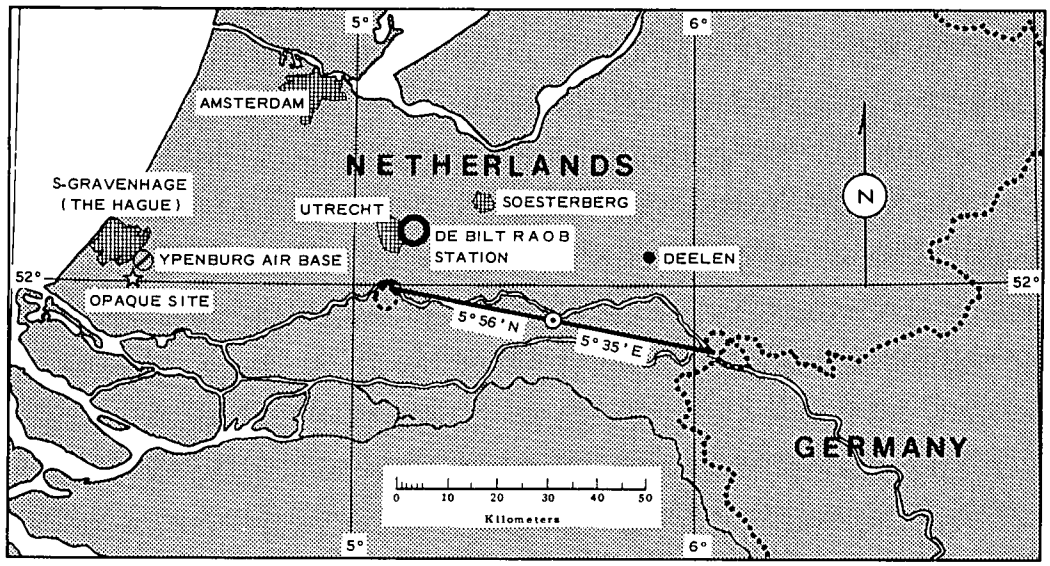


Fig. 1-1f. Typical Soesterberg Track and Data Sites, Detail Maps. Latitude and Longitude References are to Flight Track Center Point.

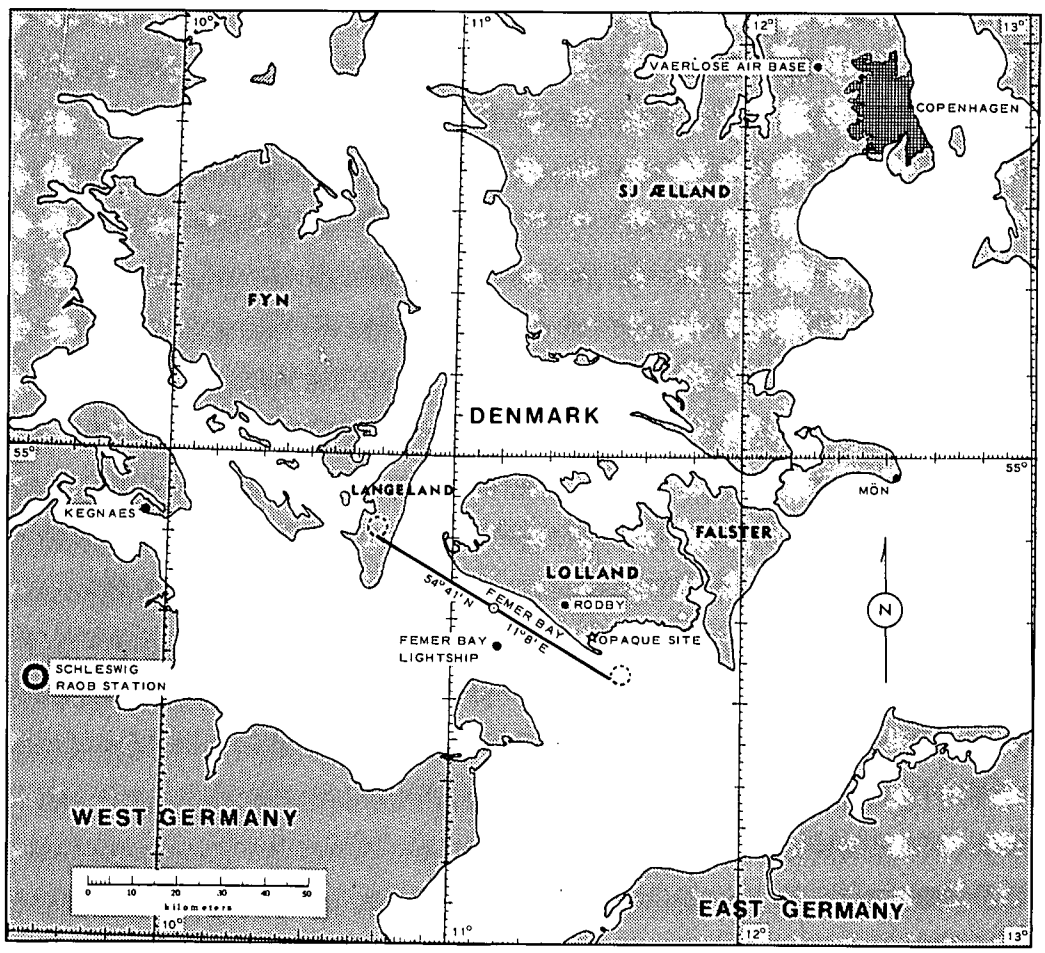


Fig. 1-1g. Typical Rodby Track and Data Sites, Detail Maps. Latitude and Longitude References are to Flight Track Center Point.

The instrumentation, developed at the Visibility Laboratory and installed in Air Force C-130A Aircraft No. 50022, is reported in detail in AFCRL-70-0137, Duntley, *et al.* (1970a), AFCRL-72-0593, Duntley, *et al.* (1972c), AFCRL-TR-75-0457, Duntley, *et al.* (1975b), and AFGL-TR-78-0286, Duntley, *et al.* (1978c). A brief review of the instrumentation as used during the OPAQUE IV deployment is presented in Section 3.

The instrumentation used to generate the raw data upon which the reported properties are based consisted of an integrating nephelometer and a dual irradiometer. Corroborative data were obtained using a ground-based contrast reduction meter, to determine earth-to-space beam transmittances when weather permitted, and a ground based integrating nephelometer.

The radiometer spectral responses were standardized for the OPAQUE IV deployment in the manner illustrated in Fig. 1-2.

Data collection methods were similar to those reported in AFGL-TR-78-0168, Duntley, *et al.* (1978b). The highest straight and level altitude was approximately 6000 meters above ground level (AGL). The basic features of these stylized daytime flight profiles are summarized in Section 4.

The computer techniques used for processing the data included in this report are summarized in Section 5. They are, in general, the same as the techniques reported in AFCRL-TR-75-0457, Duntley, *et al.* (1975b).

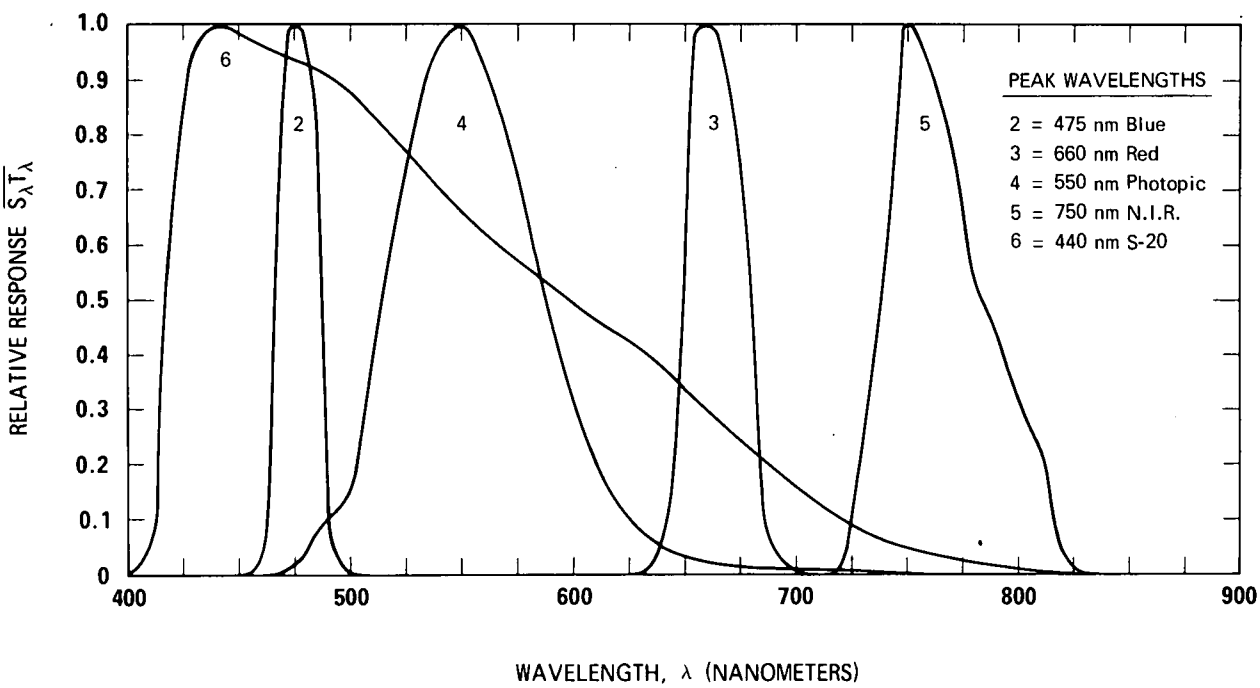


Fig. 1-2. Standard Spectral Responses - Project OPAQUE IV.

A general discussion of the weather patterns that predominated in the northern European area during the data collection interval is presented in Section 6. This section, in conjunction with the flight track photographs shown in Section 7, is intended as an aid to the data user's generalized interpretation and evaluation. The inclusion of the graphical presentations is intended to further facilitate the user's rapid orientation with the overall weather situation.

The radiometric data representing 26 separate flights are also presented in Section 7. The presentation format is similar to that used in AFCRL-TR-77-0078, Duntley, *et al.* (1977) since only scattering coefficient and irradiance data are included.

Discussion related to the interpretation and evaluation of the data collected is found in Section 8.

2. THEORY AND COMPUTATIONS

The underlying theoretical considerations upon which the data presentations made during this report interval are based, have been specified for the most part in two early publications, "Image Transmission by the Troposphere I" Duntley, *et al.* (1957) and "Model for a Clear Atmosphere", Gordon (1969). A discussion of the directional path reflectance format used in those reports which preceded the program OPAQUE series, can be found in "Directional Reflectance of Atmospheric Paths of Sight," Duntley, *et al.* (1969).

The computational procedures upon which the Visibility Laboratory bases its determinations of contrast transmission through the troposphere are documented in several preceding technical reports. The most recent of these, AFGL-TR-76-0188, "Airborne Measurements of Optical Atmospheric Properties in Northern Germany," Duntley, *et al.* (1976) is an appropriate reference and contains a substantial set of sample applications and references. Additionally, several procedural updates are described in AFGL-TR-0286, "Airborne Measurements of Optical Atmospheric Properties, Summary and Review III", Duntley, *et al.* (1978c).

The format included in the following paragraphs has been extracted from the more complete descriptions contained in the references above. It is designed to support only the selected data appearing in Section 7 herein, and is not complete enough to develop contrast transmittance or any of the other more directional atmospheric optical properties normally associated with the reports in this series.

TOTAL VOLUME SCATTERING COEFFICIENT

A direct measure of air clarity is the atmospheric attenuation coefficient $\alpha(z)$. The parenthetical modifier indicates the altitude z. The attenuation coefficient is the sum of the total volume scattering coefficient and the absorption coefficient. If there is no absorption, the attenuation coefficient is numerically equal to the total volume scattering coefficient $s(z)$.

The total volume scattering coefficient may be defined by the equation

$$s(z) \equiv \int_{4\pi} \sigma(z,\beta)\, d\Omega \,, \tag{2.1}$$

where $\sigma(z,\beta)$ is the volume scattering function at altitude z and scattering angle β. The integrating nephelometer used to make the total volume scattering coefficient measurements performs the integral in Eq. 2.1 optically. It utilizes a parallel light beam and a cosine-law collector viewing the scattered flux. The instrument is similar in principle to one of four instruments for measuring total volume scattering coefficient described by Beuttell and Brewer (1949).

BEAM TRANSMITTANCE

The beam transmittance $T_r(z,\theta)$ at altitude z, zenith angle θ, and over path length r is obtained directly from the total scattering coefficient $s(z)$ by means of Eq. 2.2. (Refer also to Boileau (1964), p. 570.) When there is no significant atmospheric absorption in the passbands of the measurements, *e.g.*, from smoke, dust or smog, the attenuation coefficient $\alpha(z)$ is equivalent to the total volume scattering coefficient $s(z)$. Therefore

$$T_r(z,\theta) = \exp\left[-\sum_{i=1}^{n}\alpha(z_i)\,\Delta r\right] = \exp\left[-\sum_{i=1}^{n}s(z_i)\,\Delta r\right], \tag{2.2}$$

where Δr is the incremental path length. The summations are made using the trapezoidal rule. The measured total volume scattering coefficient data are extrapolated to ground level when no ground-based measurements are available. The extrapolation assumes that the scattering particles are the same at all altitudes, but decrease or increase according to the density at each altitude $\rho(z)$:

$$s(0) = \frac{s(z)\rho(0)}{\rho(z)}\,. \tag{2.3}$$

Similarly, upward extrapolations are made to the highest reported altitude above ground level when the highest flight altitude is less. Extrapolation in this case is based on the scattering coefficient measured at the highest flight altitude. The densities used for the extrapolations are based upon the *U. S. Standard Atmosphere (1962).* The density at each altitude is obtained by truncated Chebyshev Expansion using the coefficients for the atmosphere between 0 and 80 kilometers *[U. S. Standard Atmosphere Supplements* (1966), p. 69].

All altitudes reported are between ground level and 6.3 kilometers maximum. For all paths of sight at zenith angles less than 85 degrees or greater than 95 degrees, Δr equals $\Delta z \sec\theta$ for these altitudes. The Δr is always nonnegative since Δz is defined as $z_1 - z_2$ (the subscripts increase with the flux direction). See Fig. 2-1. The $|\Delta z|$ used is 30 meters (98.4 feet). For zenith angles greater than 95 degrees, the beam transmittance can also be expressed as a function of the vertical beam transmittance $T_r(z, 180°)$ as follows:

$$T_r(z,\theta) = T_r(z, 180°)^{|\sec\theta|}\,. \tag{2.4}$$

For upward paths of sight for zenith angles less than 85 degrees the beam transmittance can similarly be expressed as a function of the vertical upward transmittnce $T_r(z, 0°)$. The computations described

above are useful in determining T_r for a variety of zenith angles, however, the data included in Section 7 of this summary report are restricted to the vertical path only.

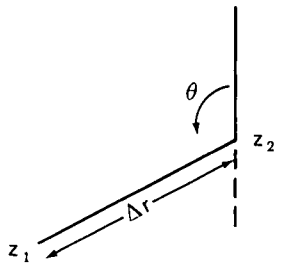


Fig. 2-1. Path Length Geometry for Steeply Inclined Paths of Sight.

ATTENUATION LENGTH

The attenuation length $L(z)$ is defined as the reciprocal of the atmospheric attenuation coefficient $\alpha(z)$. Therefore, when there is no significant absorption, it is also equivalent to the reciprocal of the atmopheric total volume scattering coefficient:

$$L \equiv \frac{1}{\alpha(z)} = \frac{1}{s(z)} . \tag{2.5}$$

The equivalent attenuation length $\bar{L}(z)$ is a pseudo-attenuation length which, when combined with its altitude z, can be used directly in the equation [Boileau (1964), Eq. 6.1]

$$T_r(z,\theta) = \exp[-z/\bar{L}(z)]|\sec\theta| , \tag{2.6}$$

where $\theta > 95°$ and path length r is between ground level and altitude z. Combining Eq. 2.6 and Eq. 2.2 and appropriately rearranging, the following expression may be obtained for effective attenuation length,

$$\bar{L}(z_n) = \frac{z_n}{\sum_{i=1}^{n} s(z_i)\,\Delta z} . \tag{2.7}$$

For $\theta < 85°$, the $\bar{L}(z)$ values should be interpreted as applying to the object altitude with the sensor at ground level.

EARTH CURVATURE AND REFRACTION

For the paths of sight at zenith angles from 90 to 95 degrees, the Δr for $|\Delta z| = 30$ meters (98.4 feet) is significantly longer at ground level than at 6 kilometers due to the curvature of the earth. Also for upward-looking paths of sight from 85 to 90 degrees, the Δr for $\Delta z = 30$ meters (98.4 feet) is significantly shorter at 6 kilometers than at ground level due to the curvature of the earth. Thus for paths of sight between 85 and 95 degrees in zenith angle, Eqs. 2.4 and 2.6 should not be used. Instead, Eq. 2.2 should be used with the appropriate Δr values.

DOWNWELLING IRRADIANCE

The downwelling irradiance on a horizontal flat plate may be defined by the equation

$$H(z,d) \equiv \int_{2\pi} N(z,\theta',\phi') \cos\theta' \, d\Omega \ , \tag{2.8}$$

where $N(z,\theta',\phi')$ is the radiance at altitude z in the direction of zenith angle θ' and azimuth ϕ'. The downwelling irradiance was measured by a dual irradiometer which performed the integration in Eq. 2.8 optically with a cosine-law collector. During the ascents and descents of the aircraft when total volume scattering coefficient was being measured, the dual irradiometer was simultaneously measuring downwelling irradiance. The downwelling irradiance provides a quantitative measure of the ambient flux levels during the flight.

UPWELLING IRRADIANCE

The upwelling irradiance on a horizontal flat plate is designated by $H(z,u)$. The dual irradiometer alternately measured upwelling and downwelling irradiance at low, intermediate, and high altitude during intervals of straight and level flight which preceded or followed the ascents and descents.

ALBEDO

Albedo $A(z)$ is defined as

$$A(z) \equiv H(z,u)/H(z,d) \ . \tag{2.9}$$

Albedos were determined from the upwelling and downwelling irradiance measurements made with the dual irradiometer during the straight and level flight intervals for each flight.

RELATIVE HUMIDITY

The relative humidity is computed using the measured ambient temperature, the measured dewpoint temperature and their associated partial pressures of water vapor. The relative humidity in percent is computed from the equation

$$RH = [{}_sP({}_dt)/{}_sP(t)]\ 100 \ , \tag{2.10}$$

where ${}_sP({}_dt)$ is the saturated vapor pressure at dewpoint or frostpoint temperature, and ${}_sP(t)$ is the saturated vapor pressure at ambient temperature. The saturated vapor pressures over water and over ice are obtained from List (1966).

3. INSTRUMENTATION

The scientific instrumentation utilized for the Project OPAQUE IV task was basically the same as that reported in AFCRL-54-75-0457, Duntley, *et al.* (1976). Consequently, the descriptions contained herein have been edited to include only those systems directly related to the scattering coefficient and irradiance data. The total instrumentation package utilized during the Project OPAQUE IV deployment is illustrated in Fig. 3-1 and 3-2.

3.1. RADIOMETRIC SYSTEMS

Of the seven different types of radiometric collector assemblies mounted on board the aircraft, only two have their descriptive summaries included in this report, the integrating nephelometer and the dual irradiometer.

INTEGRATING NEPHELOMETER (NEPH) ASSEMBLY

In order to measure and evaluate the total volume scattering coefficient for typical real aerosols, the Visibility Laboratory has devised and built an instrument referred to as an integrating nephelometer. The basic structure of the device consists of the subassembly illustrated in Fig. 3-3 and an enclosing light tight box. In the airborne version, ram air driven by the aircraft's forward velocity is routed through the box via four one-inch diameter inlet tubes and four one and one-half inch diameter exhaust tubes. In the ground based version, the airflow is drawn through the sampling volume by an exhaust fan located within the housing immediately adjacent to the exhaust ports. The somewhat larger shroud configuration utilized with the ground based nephelometer is illustrated in Fig. 3-2. In this view, the inlet probes are the vertical stacks at the right end of the shroud. The exhaust ports are in the bottom of the shroud at the nearer left end, and are not visible from the angle illustrated.

In its operational mode, the integrating nephelometer measured the radiant flux scattered by the transient aerosol as it passes through the geometrically well defined flux beam from a high intensity projector. The scattered flux is sequentially collected through one of three different optical channels: two telescopes, each having 2-degree circular fields of view oriented to collect the flux scattered in the $\beta = 30°$ and $\beta = 150°$ directions, and one 2π irradiometer assembly oriented to collect the flux scattered in all scattering angles between $\beta = 5°$ and $\beta = 172.5°$. From these measurements plus the measurement of a well defined calibration flux level, the directional scattering functions $\sigma(30)$ and $\sigma(150)$ and the total volume scattering coefficient s may be derived.

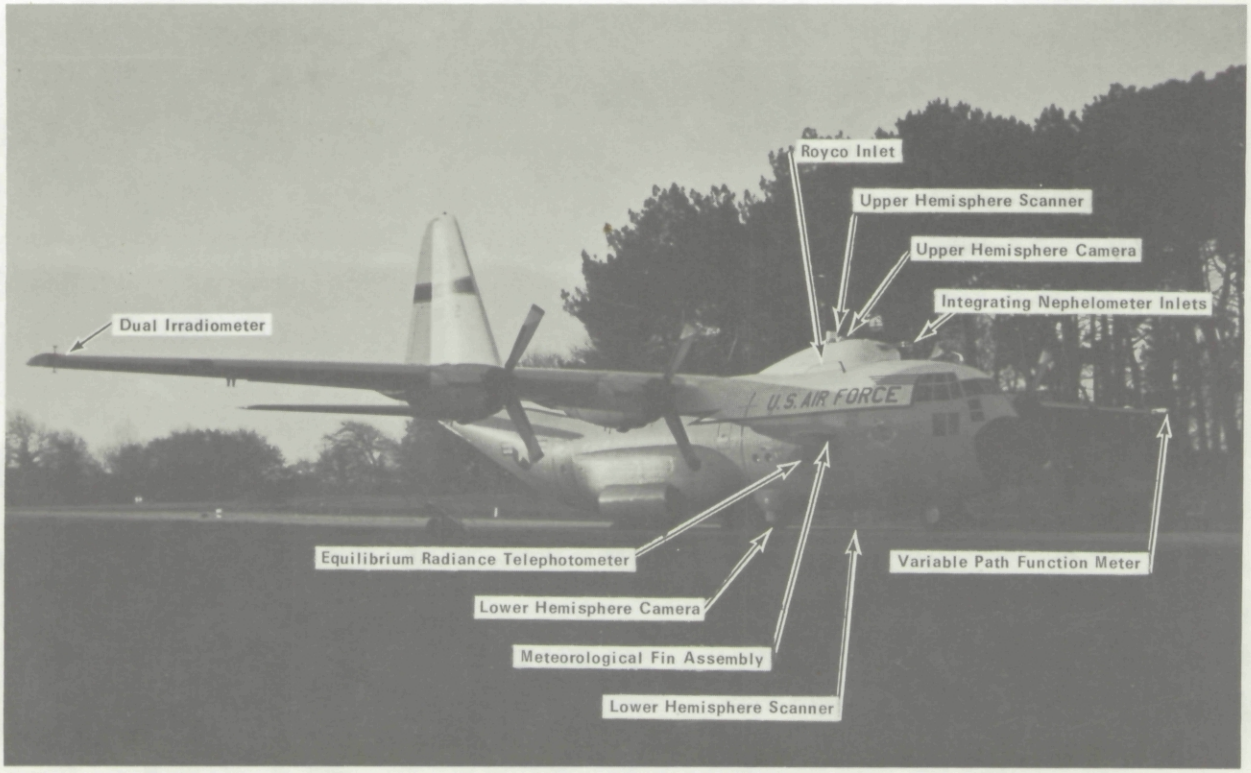


Fig. 3-1. C-130 Airborne Instrument System.

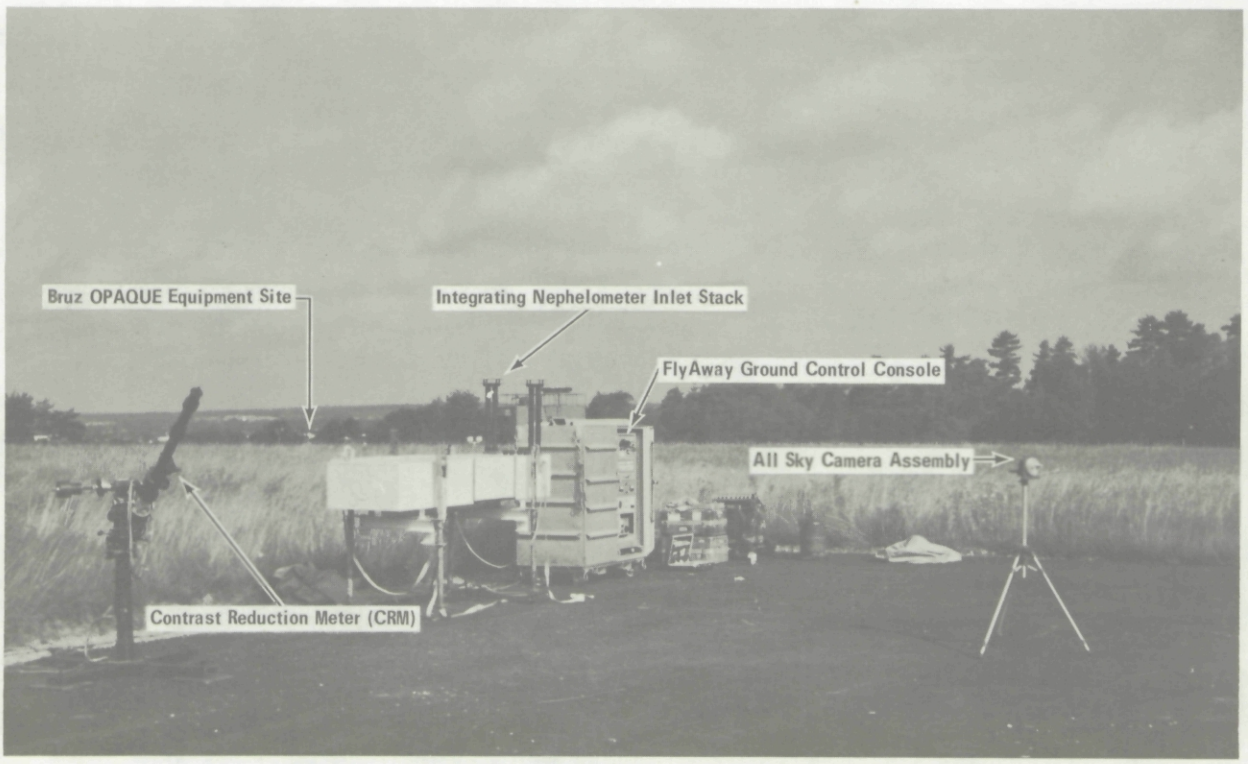


Fig. 3-2. Ground-Based Instrument System.

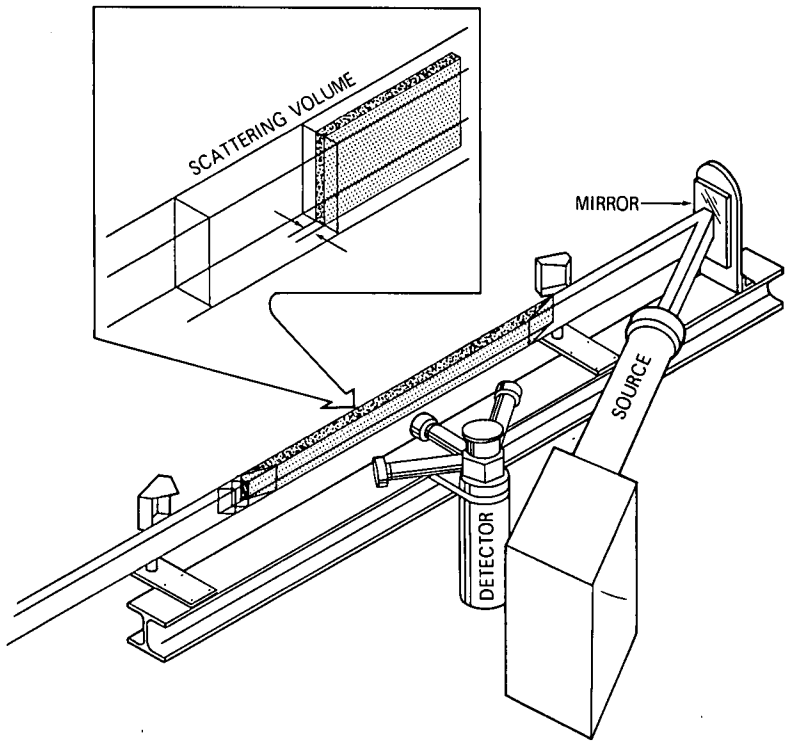


Fig. 3-3. Artist's Rendition of Modified Integrating Nephelometer.

In its simplest form, the equation which is used to compute the total volume scattering coefficient is

$$s = \frac{{}_sH\,K}{{}_rH\,F}, \tag{3.1}$$

where

${}_sH$ is the flux scattered from the beam and collected by the instrument's irradiometer channel while in the operational mode, and

${}_rH$ is the flux reflected from a diffusely reflecting calibration plaque and collected by the irradiometer channel while the instrument is in the calibration mode.

The constants K and F are rather extensive integral expressions which relate the geometry of the scattering volume with respect to the irradiometer cap location, the irradiance distribution in the flux beam, the transmittance and reflectance characteristics of the collector cap and calibration plaque, and the most probable shape of the scattering function associated with the sample aerosol.

The ratio K/F for the airborne integrating nephelometer has been computed using the Rayleigh volume scattering function and a set of ten additional volume scattering functions representative of a broad range of real atmospheres as determined from Barteneva (1960). Using the in-flight measured values of $\sigma(30)$ and $\sigma(150)$ from the nephelometer, the most probable scattering function for the sample aerosol can be selected, and the appropriate K/F factor applied. It is the application of this procedure for determining the most probable scattering function from measured data, and applying this supplementary knowledge of the character of the sample aerosol as a correction to the measurement for total scattering coefficient which makes this instrument unique and potentially superior for research applications.

The mechanical and optical configurations of the integrating nephelometer utilized on the OPAQUE IV deployment have changed from those reported in AFCRL-70-0137, Duntley, *et al.* (1970a). The basic change is that the projector beam has been optically folded by inserting a plane mirror into the beam between the projector and the beginning of the scattering volume. This optical folding illustrated in Fig. 3-3 has enabled the shortening of the mechanical frame and housing such that the entire assembly can be enclosed in an aerodynamic shroud. The modified nephelometer is illustrated in AFCRL-TR-75-0457, Duntley, *et al.* (1975b). The operating characteristics of the revised nephelometer were discovered to suffer from abnormally high stray light problems during the post deployment analysis of the OPAQUE I and II data, and further modification was accomplished subsequent to its return to the Laboratory. Evaluation of the experimental and diagnostic evidences of these apparent stray light problems is continuing.

During an Air-Ground calibration check conducted early in the OPAQUE IV deployment, an unanticipated mismatch between measurements made by the two nephelometer systems was detected.

A field fix involving a realignment of the two detector assemblies was instituted after several days of diagnostic testing. As a result of this realignment, several modifications to the data processing and calibration procedure were instituted in handling the OPAQUE IV data. These modifications and their implications are discussed more thoroughly in Section 8.

The folded-path nephelometer is enclosed in the modified radome shown on top of the aircraft in Fig. 3-1, and an artist's rendition of the arrangement of the internal subassemblies is illustrated in Fig. 3-3.

DUAL IRRADIOMETER (DI) ASSEMBLY

The dual irradiometer assembly is a two-channel irradiometer. It has two optical input channels but only one optical output. A rotating prism subassembly allows the system operator to select either input channel for optical coupling with the output channel, while simultaneously occulting the other. The resultant time-sharing of a single detector assembly yields a device optimized for ratio type measurements.

The flat plate diffuse collector surfaces used in this assembly are mechanically corrected to yield cosine collection characteristics between 0 and 90 degrees which are within ± 2 percent of true cosine for all angles of incidence between 0 and 80 degrees.

The dual irradiometer assembly is mounted on the aircraft wingtip so that the flat plate collectors are horizontal during normal straight and level (ST&LV) flight elements. In this configuration the upper channel receives radiant flux from the entire hemisphere below the aircraft. These measurements of downwelling and upwelling irradiance can be used both in the calculation of environmental albedos, $A(z)$, and in intersystem data validation checks.

3.2. METEOROLOGICAL SYSTEMS

All of the meteorological systems utilized in this project were purchased items; the operating characteristics of each are available in the appropriate manufacturer's brochures. For use in Project OPAQUE IV, the meteorological systems were unchanged from the configurations reported in AFCRL-72-0593, Duntley, *et al.* (1972c).

The airborne meteorological package consisted of one Royco Model 220 particle counter, one Cambridge Model 137-C3 aircraft hygrometer system, one AN/AMQ-17 aerograph set, and two Bourns aneroid pressure transducers.

Since all of the meteorological systems were described in AFCRL-72-0593, Duntley, *et al.* (1972c), no further discussion is included in this report.

3.3. CONTROL AND COMMUNICATION SYSTEMS

The basic control panels, consoles, and other support facilities associated with the airborne instrument system are described fully in AFCRL-72-0593, Duntley, *et al.* (1972c).

3.4. PHOTOGRAPHIC SYSTEMS

Photographic documentation of the test environment performed simultaneously with the radiometric and meteorological measurements has always been a highly desirable adjunct to any field activity. For Project OPAQUE IV, this photographic capability was accomplished by the Visibility Laboratory through the use of two camera systems.

AIRBORNE AUTOMAX G-1 CAMERA SYSTEM

Two 35-millimeter Automax G-1 cameras, modified to accept Traid 735 Periphoto (180-degree) lenses, were mounted on the project aircraft (Fig. 3-1). One camera was oriented to photograph the 2π upper hemisphere and the other covered the 2π lower hemisphere. Either or both cameras may be run in either cine or single-frame modes at the discretion of the operator.

The photographs from these cameras are used only as general background for the interpretation of the radiometric measurements. Thus, no special controls are placed upon the film or its processing. For this general-purpose application, the cameras are normally loaded with Kodak Ektacolor Professional S, No. 5026 film. Typical photographs from this system are used as illustrations in Section 7 of this report and were shot with a fixed f/6.3 aperture in the single-frame mode.

During the OPAQUE IV deployment, the drive motor in one of these Automax cameras failed resulting in a substantial loss of photographic documentation. Consequently, the photographic summary in Section 8 in this report is less complete than one would anticipate from a deployment of this magnitude.

GROUND-BASED SOLIGOR SYSTEM

The ground-site documentation photographs have historically been limited to 35-millimeter color snapshots, taken on a casual basis during lulls in the experimental sequences. For Project OPAQUE IV this procedure was supplemented with a scheduled routine of site photographs using a Soligor Conversion Fisheye lens. This lens possesses almost universal adaptability to a wide variety of cameras and prime lenses. During Project OPAQUE IV it was used on a Yashica, Lynx 1000.

3.5. RADIOMETRIC CALIBRATION PROCEDURES

All the radiometers used in this project are calibrated in essentially the same manner. In each case, the system is calibrated first by determining its relative flux versus high voltage characteristics over the anticipated operating span and second by establishing known absolute flux levels on this voltage curve. The entire calibration procedure is conducted by using standard photometric practices, a 3-meter optical bench, and incandescent standards of luminous intensity traceable to the National Bureau of Standards.

A detailed discussion of these calibration procedures is contained in AFCRL-70-0137, Duntley, *et al.* (1970a), AFGL-TR-76-0188, Duntley, *et al.* (1976), and most of the intervening reports in this series. The discussion therefore will not be repeated herein.

A typical data sheet for the absolute calibration of a Project OPAQUE IV radiometer is shown in Fig. 3-4. Five different levels of input radiance are used in the determination of the calibration constant for the system. The calibration constant is referred to as the zero scale value and is labeled ZSV on the calibration forms.

CALIBRATION CORRECTION FACTORS

Several calibration correction factors are used with the calibration data illustrated in Fig. 3-4 to generate the calibration constants listed in Table 3.1. In general, the factors are used at will to convert radiometric units into photometric units and reconvert them, and to adjust the value of measurements taken with an instrument having a nearly standard spectral response to the value that would have been obtained using the exact standard spectral response specified in Section 3.6.

These correction factors are discussed at length in AFCRL-70-0137 and AFCRL-72-0461, Duntley, *et al.* (1970a and 1972b). Thus, they are not discussed further at this time.

ABSOLUTE CALIBRATION FOR

(30) NEPH-1 SIGMA (21253 NS) (IRRADIOMETER) TAKEN ON 5/ 9/78 (POSTOPIV) DEPLOYMENT

FILTER NO. 4 (XENON 5500 DEGREES KELVIN)

SPAN ID	D1 CM	TOTAL DIST. CM	TOTAL DIST.SC. CM.SC.	CALC.TGT. B OR E *	DETEC. RAW OUTPUT	LOG OF (KO/K)	RAW ZSV	PERCENT DIFF OF RAW AVG	AVG RAW ZSV	F1 LUM. TO RAD./ WATTS/LUM.	F2 COLOR MATCH	CORRECTED ZSV
1	40	116.300	1.353E 04	7.586E-05	490	0	0	0	5.064E-05	1.050E-03	1.017E 00	5.408E-08
2	70	146.300	2.140E 04	4.794E-05	462	.018	4.992E-05	1.4				
3	120	196.300	3.853E 04	2.643E-05	425	.281	5.089E-05	-.5				
4	200	276.300	7.634E 04	1.344E-05	380	.573	5.023E-05	.8				
5	300	376.300	1.416E 05	7.246E-06	335	.850	5.129E-05	-1.3				
5	300	376.300	1.416E 05	7.246E-06	336	.846	5.082E-05	-.3				
4	200	276.300	7.634E 04	1.344E-05	382	.564	4.928E-05	2.7				
3	120	196.300	3.853E 04	2.643E-05	424	.288	5.174E-05	-2.2				
2	70	146.300	2.140E 04	4.794E-05	461	.027	5.098E-05	-.7				
1	40	116.300	1.353E 04	7.586E-05	488	0	0	0				

LINEARITY MAXIMUM = (463) APPLIED CUTOFF = (-861)
LINEARITY CALIB. END = (-861) FULL DARK = (-1007) CUTOFF = (-861)

* CALCULATED ILLUMINANCE IN LUMENS/SQ.CM.

RAW ZSV STD = (7.8583E-07) FRACT. STD = (1.56) PERCENT ZSV IN WATTS/SQ. CM. IS 5.408E-08

WITH UNIT CONVERSION FACTOR OF (127300.00000), TO CHANGE UNITS FROM (W/ SQ. CM) TO (W/ SQ. M MICRO M) THE NEW ZSV IN WATTS(SQ. M MICRO M. IS 6.88423E-03

THIS FILTER IS PSEUDO-PHOTOPIC. TO CONVERT TO TRUE PHOTOPIC STANDARD (SEE TECHNICAL MEMORANDUM AV71-0051)
FOR DAYLIGHT DATA MULTIPLY BY 72.000LUMEN-UM / WATT. PHOTOPIC ZSV IS 4.95664E-01 LUMEN/ SQ M.
FOR NIGHT TIME LIGHTING MULTIPLY BY 68.340LUMEN-UM / WATT. PHOTOPIC ZSV IS 4.70468E-01 LUMEN/ SQ M.
FOR NEPHELOMETER ONLY MULTIPLY BY 72.216LUMEN-UM / WATT. PHOTOPIC ZSV IS 4.97151E-01 LUMEN/ SQ M.

MV FLUCTUATION DATA DURING EACH CALIB MEASUREMENT

SPAN ID	STD. DEV. IN MV	FRACT STD DEV IN PERCENT
1	0	0
2	4.787E-01	1.035E-01
3	4.472E-01	1.053E-01
4	1.195E 00	3.143E-01
5	5.737E-01	1.713E-01
5	8.062E-01	2.402E-01
4	8.062E-01	2.113E-01
3	4.787E-01	1.130E-01
2	9.979E-01	2.164E-01
1	5.000E-01	1.025E-01

CALIBRATION LAMP IDENTIFICATION

SERIAL NUMBER = VLA0201
LAMP INTENSITY = 20.52
DISTRIBUTION TEMPERATURE = 2854
MONITOR CURRENT CHANNEL = 4

CALIBRATION TARGET DATA

REFLECTANCE OF PATH ATTENUATOR(PERCENT) = 5.0
REFLECTANCE OF CALIBRATION TARGET(PERCENT) = 100.0
DTOTAL = LAMP DISTANCE = D1 + D2. D2(CM) = 76.3
PHOTOMETER DATA CHANNEL = 1

Fig. 3-4. Typical Absolute Calibration Form.

Table 3.1. Project OPAQUE IV Radiometer Calibration Constants (ZSV) and Related Fractional Standard Deviations (δ)

Radiometer Identification		Calib	Calib	Filter 2		Filter 4		Filter 3		Filter 5		Average δ%
System	MPT SN	Mode	Units	ZSV	δ%	ZSV	δ%	ZSV	δ%	ZSV	δ%	for System
NEPH1 Σ	21253	Out	$w/m^2\mu m$	2.07E-02	3	6.88E-03	2	5.46E-02	1	4.73E-01	2	2
NEPH1 β 30	21253	Out	$w/\Omega m^2\mu m$	1.83E-02	2	6.90E-03	1	5.67E-02	1	6.86E-01	2	1
DI*	9858	In	$w/m^2\mu m$	3.02E 04	2	8.78E 03	1	3.58E 04	1	7.34E 04	2	1

3.6. STANDARD RESPONSE CHARACTERISTICS FOR BROAD BAND SENSORS

A summary of the response characteristics of the standards for Project OPAQUE IV is presented in Table 3.2. The first four columns give filter code, peak wavelength, mean wavelength, and response area, terms which are fully defined in preceding reports such as AFGL-TR-76-0188, Duntley, *et al.* (1976). The values for inherent solar properties are in columns 5, 6, and 7, and the Rayleigh limits are in columns 8, 9, 10. The table was produced by Program RAYLIMIT.

All the radiometric instruments both ground-based and airborne used by the atmospheric visibility branch are equipped with automatic filter changing assemblies. Thus any one of five different spectral filters can be interposed into each instrument's optical path. The combination of the sensor sensitivity S_λ and the filter transmittance T_λ is the resultant sensitivity of the filtered phototube $S_\lambda T_\lambda$. The standard responses which each optical system attempts to duplicate are indicated as $\overline{S_\lambda T_\lambda}$, and are illustrated in Table 3.3. No system has true photopic response, Filter Code 9, but this ideal response is included for comparative purposes only.

Table 3.2. Spectral Characteristics Summary for Project OPAQUE IV.

Spectral Characteristics for Project OPAQUE IV				Inherent Sun Properties (Johnson)			Rayleigh Atmosphere Properties (15°C)		
Filter Code No.	Peak Wavelength (nm)	Mean Wavelength (nm)	Response Area (nm)	Irradiance ($w/m^2\mu m$)	Radiance ($w/\Omega m^2\mu m$)		Attenuation Length (m)	Total Scattering Coefficient (per m)	Vertical Beam Transmittance
					Average	Center			
2	475	478	19.9	2.14E+03	3.13E+07	4.07E+07	4.84E+04	2.07E−05	0.839
3	660	664	30.2	1.57E+03	2.30E+07	2.75E+07	1.86E+05	5.41E−06	0.955
4	550	557	78.5	1.90E+03	2.78E+07	3.47E+07	8.93E+04	1.15E−05	0.907
5	750	765	50.4	1.23E+03	1.80E+07	2.10E+07	3.28E+05	3.08E−06	0.974
6	440	532	183.5	1.91E+03	2.80E+07	3.55E+07	7.22E+04	1.64E−05	0.867
9	555	560	106.9	1.89E+03	2.77E+07	3.45E+07	9.22E+04	1.15E−05	0.907

Table 3.3. Relative Spectral Response of Standards for Project OPAQUE IV.

Filter Identification and Mean Wavelength							Filter Identification and Mean Wavelength						
Wavelength (nm)	No. 2 Blue 478nm	No. 3 Red 664nm	No. 4 Pseudo-Photopic 557nm	No. 5 NIR 765nm	No. 6 S-20 532nm	No. 9 True Photopic 560nm	Wavelength (nm)	No. 2 Blue 478nm	No. 3 Red 664nm	No. 4 Pseudo-Photopic 557nm	No. 5 NIR 765nm	No. 6 S-20 532nm	No. 9 True Photopic 560nm
400	0	0	0	0	0	0.0004	615	0	0	0.1680	0	0.4500	0.4412
405	0	0	0	0	0.0129	0.0006	620	0	0	0.1300	0	0.4390	0.3810
410	0	0	0	0	0.0258	0.0012	625	0	0	0.1055	0	0.4260	0.3210
415	0	0	0	0	0.2969	0.0022	630	0	0	0.0810	0	0.4130	0.2650
420	0	0	0	0	0.5680	0.0040	635	0	0.0020	0.0657	0	0.3935	0.2170
425	0	0	0	0	0.7605	0.0073	640	0	0.0486	0.0504	0	0.3740	0.1750
430	0	0	0	0	0.9530	0.0116	645	0	0.1798	0.0411	0	0.3545	0.1382
435	0	0	0	0	0.9765	0.0168	650	0	0.5531	0.0318	0	0.3350	0.1070
440	0	0	0	0	1.0000	0.0230	655	0	0.9948	0.0268	0	0.3190	0.0816
445	0	0	0	0	0.9920	0.0298	660	0	1.0000	0.0218	0	0.3030	0.0610
450	0	0	0	0	0.9840	0.0380	665	0	0.9421	0.0188	0	0.2845	0.0446
455	0	0	0	0	0.9720	0.0480	670	0	0.8625	0.0157	0	0.2660	0.0320
460	0.0070	0	0	0	0.9600	0.0600	675	0	0.7482	0.0139	0	0.2480	0.0232
465	0.1487	0	0	0	0.9510	0.0739	680	0	0.4774	0.0120	0	0.2300	0.0170
470	0.8481	0	0	0	0.9420	0.0910	685	0	0.1585	0.0105	0	0.2105	0.0119
475	1.0000	0	0.0172	0	0.9355	0.1126	690	0	0.0495	0.0090	0	0.1910	0.0082
480	0.9329	0	0.0343	0	0.9290	0.1390	695	0	0.0166	0.0080	0	0.1755	0.0057
485	0.8304	0	0.0677	0	0.9175	0.1693	700	0	0	0.0070	0	0.1600	0.0041
490	0.1790	0	0.1010	0	0.9060	0.2080	705	0	0	0.0061	0	0.1445	0.0029
495	0.0292	0	0.1185	0	0.8920	0.2586	710	0	0	0.0053	0	0.1290	0.0021
500	0	0	0.1360	0	0.8780	0.3230	715	0	0	0.0048	0	0.1170	0.0015
505	0	0	0.2635	0	0.8560	0.4073	720	0	0	0.0042	0	0.1050	0.0010
510	0	0	0.3910	0	0.8340	0.5030	725	0	0	0.0038	0.1005	0.0938	0.0007
515	0	0	0.5085	0	0.8135	0.6082	730	0	0	0.0033	0.2010	0.0826	0.0005
520	0	0	0.6260	0	0.7930	0.7100	735	0	0	0.0030	0.4155	0.0723	0.0004
525	0	0	0.7345	0	0.7715	0.7932	740	0	0	0.0026	0.6300	0.0619	0.0003
530	0	0	0.8430	0	0.7500	0.8620	745	0	0	0.0025	0.8150	0.0558	0.0002
535	0	0	0.9065	0	0.7250	0.9149	750	0	0	0.0023	1.9000	0.0497	0.0001
540	0	0	0.9700	0	0.7000	0.9540	755	0	0	0.0020	0.9595	0.0416	0.0001
545	0	0	0.9850	0	0.6785	0.9803	760	0	0	0.0018	0.9190	0.0335	0.0001
550	0	0	1.0000	0	0.6570	0.9950	765	0	0	0.0017	0.8495	0.0292	0
555	0	0	0.9665	0	0.6385	1.0002	770	0	0	0.0016	0.7800	0.0249	0
560	0	0	0.9330	0	0.6200	0.9950	775	0	0	0.0014	0.6620	0.0206	0
565	0	0	0.8685	0	0.6030	0.9786	780	0	0	0.0013	0.5440	0.0162	0
570	0	0	0.8040	0	0.5860	0.9520	785	0	0	0.0012	0.4890	0.0144	0
575	0	0	0.7195	0	0.5700	0.9154	790	0	0	0.0012	0.4340	0.0125	0
580	0	0	0.6350	0	0.5540	0.8700	795	0	0	0.0012	0.3720	0.0107	0
585	0	0	0.5525	0	0.5385	0.8163	800	0	0	0.0011	0.3100	0.0088	0
590	0	0	0.4700	0	0.5230	0.7570	805	0	0	0.0005	0.2675	0.0075	0
595	0	0	0.3950	0	0.5060	0.6949	810	0	0	0	0.2250	0.0062	0
600	0	0	0.3200	0	0.4890	0.6310	815	0	0	0	0.1125	0.0031	0
605	0	0	0.2630	0	0.4750	0.5668	820	0	0	0	0	0	0
610	0	0	0.2060	0	0.4610	0.5030							

4. DATA COLLECTION METHODS

During Project OPAQUE IV, two independent activities were maintained simultaneously. The operation of the airborne instrument system was one activity and that of the ground-based instrument system was the other. The procedural routine was for each system to run full data collection sequences at every opportunity, on a daily schedule, as weather permitted.

4.1. AIRBORNE SYSTEM

The data collection sequence for the airborne system was broken into five standardized elements: (1) preflight warmup and calibration check, (2) straight and level sequences, (3) vertical profile sequences, (4) in-flight calibration checks, and (5) post-flight calibration check.

An illustration of our typical flight pattern which was used for most OPAQUE IV flights, is shown in Fig. 4-1. In this stylized pattern, two basic elements, the straight and level (ST&LV) and the vertical profile (V-PRO), were combined to yield the total mission flight plan. A description of these two pattern elements and the calibration elements is detailed in AFCRL-72-0255, Duntley, *et al.* (1972a), modified in AFCRL-54-75-0457, Duntley, *et al.* (1975b), and summarized in the following paragraphs.

1. Straight and Level runs (ST&LV), Mode 03 - The ST&LV runs were primarily 2π scanner runs. The measurement of upper and lower hemisphere radiance distributions had top priority. One sky mode scanner pattern (192 seconds) plus one sun mode scanner pattern (64 seconds) were run at each altitude with each of the two optical filters.

   During ST&LV runs the aircraft maintained a fixed heading, a constant indicated airspeed of 150 knots or less, and a 2.5 degree nose-high flight altitude.

2. Vertical Profile runs (V-PRO), Mode 07 - The V-PRO runs were primarily integrating nephelometer and variable path function meter runs. The measurement of the total scattering coefficient profile had top priority. Second priority was measurement of the vertical path function profile. Each V-PRO ascent or descent was made using a single filter.

   During the V-PRO runs the aircraft maintained a fixed heading, with the sun off the left wingtip, and a flight attitude not exceeding 4 degrees nose down or 8 degrees nose up. An average rate of climb or descent of 1200 feet/minute was optimum, and airspeed was not critical, but remained constant once established.

3. Cross-Calibration Climbs (X-CAL), Mode 08 - The X-CAL climbs were specifically designed to validate the performance of the UHS, LHS, and ERT radiometer systems. The simultaneous measurement of a common uniform segment of sky by these three radiometers had

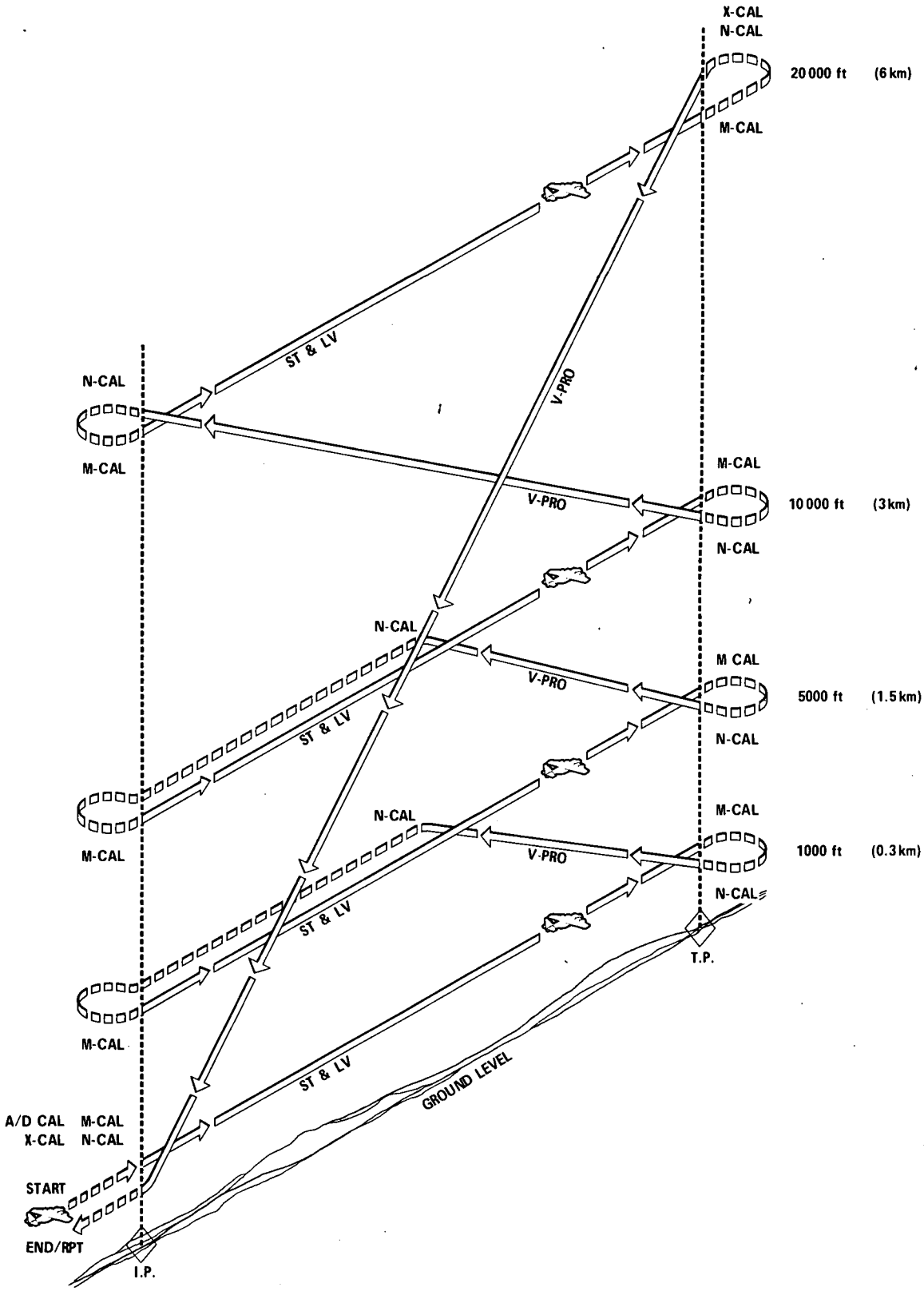


Fig. 4-1. Typical Visibility Laboratory Flight Profile.

top priority. Two X-CAL climbs were associated with each standard profile, one preceding the first ST&LV run and the second following the last ST&LV run. Both sky mode and sun mode measurements were made with the UHS system.

During the 4-minute X-CAL climb the aircraft maintained a fixed heading, with the sun in the aft hemisphere, and a 5-degree nose-high flight attitude. The aircraft flown directly toward the clearest and most uniform portion of the sky as was practical.

4. Calibration Blocks (A/D CAL), Mode 00, M-CAL, Mode 01, N-CAL, Mode 09 - The 32-second blocks of calibration data were inserted periodically throughout the entire data mission. They were designed to provide calibration update information to the post-flight computer processing sequences. There are 21 assorted calibration blocks associated with each (2+4) profile.

   During these calibration blocks there were no project-imposed requirements upon aircraft speed or attitude.

GENERAL FLIGHT PATTERN

The standard (2+4) profile is illustrated in Fig. 4-1. In this profile, ST&LV data runs were made using two different spectral filters at each of four altitudes. The ascent V-PRO was made using the first of the two filters, and the descent V-PRO was made using the second. After the descent V-PRO, the entire sequence was repeated using a second pair of filters.

The idealized flight profile would result in all ground tracks falling on a single line running between the Initial Point (I.P.) and the Turning Point (T.P.). See Fig. 4-1. In practice, the ST&LV elements were actually stacked in a slab of atmosphere approximately 30 miles (48 km) long, 0.5 mile (0.8 km) wide, and 4 miles (6.4 km) high.

Periodically, in response to specialized data requirements or weather conditions, supplementary flight patterns were added to the mission profile. For OPAQUE IV, a pattern made up of a (2+3) profile, i.e., two spectral filters at each of three altitudes was used as was a (2+2) profile, i.e., two spectral filters at each of two altitudes. Both the (2+3) and (2+2) profiles are generally considered low to medium altitude profiles, and were normally used on flights performed under a full overcast or low to intermediate level cloud decks. Thirteen flights consisted of V-PRO climb outs, supplemented with only directional scattering measurements at the the minimum and maximum altitudes.

At the conclusion of each mission, the radiometric data which were recorded and stored on magnetic tape were returned to the Visibility Laboratory for computer reduction and analysis.

4.2. GROUND-BASED SYSTEM

The ground-based data collection sequence was designed to supplement the airborne data whenever the aircraft was operating in the immediate vicinity. However, it was also complete enough to stand alone when the aircraft mission was diverted or aborted.

During the OPAQUE IV deployment, the fly-away Contrast Reduction Meter (CRM) and an integrating nephelometer were used on the ground station.

The primary function of the CRM system is to determine the earth-to-space beam transmittance for comparison with the data from the airborne systems. The basis for the measurement techniques utilizing the CRM was first presented by Gordon, *et al.* (1963) and validated by Duntley, *et al.* (1964). It is also discussed in Edgerton (1967) and summarized in Gordon, *et al.* (1973). A similar configuration of the device is described in Duntley, *et al.* (1970b).

The operational and computational procedures related to the CRM system are described in detail in Duntley, *et al.* (1972b), and briefly summarized in the following paragraph.

Four basic measurements using the CRM are required in order to provide proper inputs to the computation of earth-to-space universal contrast transmittance. They are:

1. Apparent Solar Radiance.
2. Path Radiance, i.e., Sky Radiance, at an appropriate scattering angle from the sun.
3. Total Downwelling Irradiance.
4. Inherent Background Radiance, i.e., generally a selected terrain radiance.

Since the CRM is conceived as a clear day system, requiring clear skies, its daily data collection schedule was often cut short, or aborted by poor weather during the OPAQUE IV deployment. Under highly variable weather conditions, priority is assigned to measurements of apparent solar radiance in order to retrieve a maximum number of determinations for atmospheric beam transmittance. These measurements are recorded manually for subsequent insertion into the automatic data processing and evaluation procedure.

The ground based integrating nephelometer utilized during OPAQUE IV was a folded path device, optically equivalent to the airborne system. It was constructed using the major mechanical and optical components from an earlier truck mounted system.

This rebuilt ground based integrating nephelometer and the airborne model used identical detectors, mode selector heads, calibrators, and mirror assemblies. The projectors were both 500 watt Xenon, however there were minor differences in the lamp housings. The only significant difference between the two systems was in the shroud design. The ground based shroud is considerably larger, hence the interior stray light problems should be smaller. The light trap for the ground nephelometer projector beam is further from the sampling volume and is a more efficient design; thus its influence on the scattering volume should be less. The ground based shroud has a built-in exhaust fan to draw the aerosol through the main shroud instead of using ram air as does the airborne model. Data recording, as with the CRM, was manual.

5. DATA PROCESSING

As in any reasonably complex, multi-input sampled data system, there is a large amount of data handling required before the scientific analyst ever sees the package. The degree of data processing sophistication utilized during this contract interval is illustrated in Fig. 5-1 and 5-2. In these generalized flow charts, the basic functional steps used in the data processing of the raw field data are clearly specified. They do not illustrate, however, all of the miscellaneous routines used for data base management and special diagnostic purposes. A more complete description of each phase of the processing sequence is contained in AFCRL-72-0255, AFCRL-72-0593, Duntley, *et al.* (1972a and c), and AFCRL-TR-75-0457, Duntley, *et al.* (1975b).

5.1. AIRBORNE DATA

As described in AFCRL-72-0255, Duntley, *et al.* (1972a), several classes of data are recorded during an airborne data set: (1) radiometer outputs, (2) selector control codes, (3) transducer orientation and flight attitude signals, and (4) calibration voltages, etc. All systems, regardless of type, have been designed for an electrical output between 0 and ± 1 volt dc for full scale. The 42-channel data logger has a least count of ± 1 millivolt and records in digital format at a multiplex rate of 240 samples per second and a tape rate of 3.56 inches per second at a recording density of 200 bits per inch.

Several major improvements to the airborne data processing procedure have been implemented during the interval since AFCRL-72-0593, Duntley, *et al.* (1972c) and AFCRL-54-75-0457, Duntley, *et al.* (1975b). The insertion of these programs is summarized in AFGL-TR-76-0188, Duntley, *et al.* (1976) and is illustrated in Fig. 5-1. Subsequent comments related to these and similar procedural updates is contained in AFGL-TR-78-0168, "Airborne Measurements of Optical Atmospheric Properties, Summary and Review III", Duntley, *et al.* (1978c). These programs, and the increased diagnostic capabilities that their usage has enabled, have materially improved the quality of the upper hemisphere radiance maps, and thus the quality of all subsequently computed optical atmospheric properties.

In order to produce the data included in this short form report, it was not necessary to run the programs illustrated in the upper portion of Fig. 5-1. That is, those programs related to the processing of automatic scanner data, MIRESCAN, SCANTSUM, etc., were bypassed. In this manner the AVIZC130 runs were shortened to only the first overlay for the production of scattering coefficient and beam transmittance profiles.

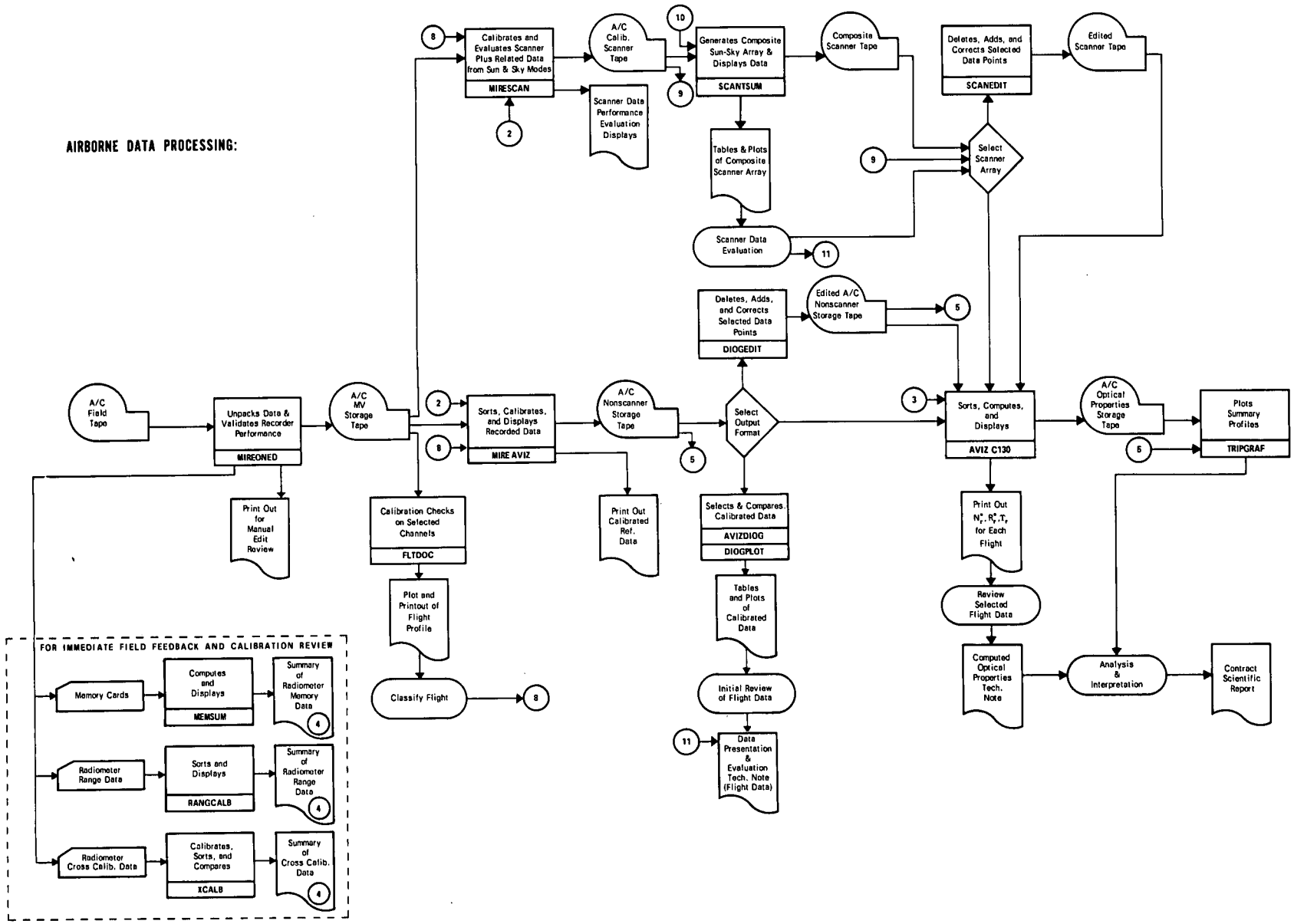


Fig. 5-1. Atmospheric Visibility Program Data Processing Schedule.

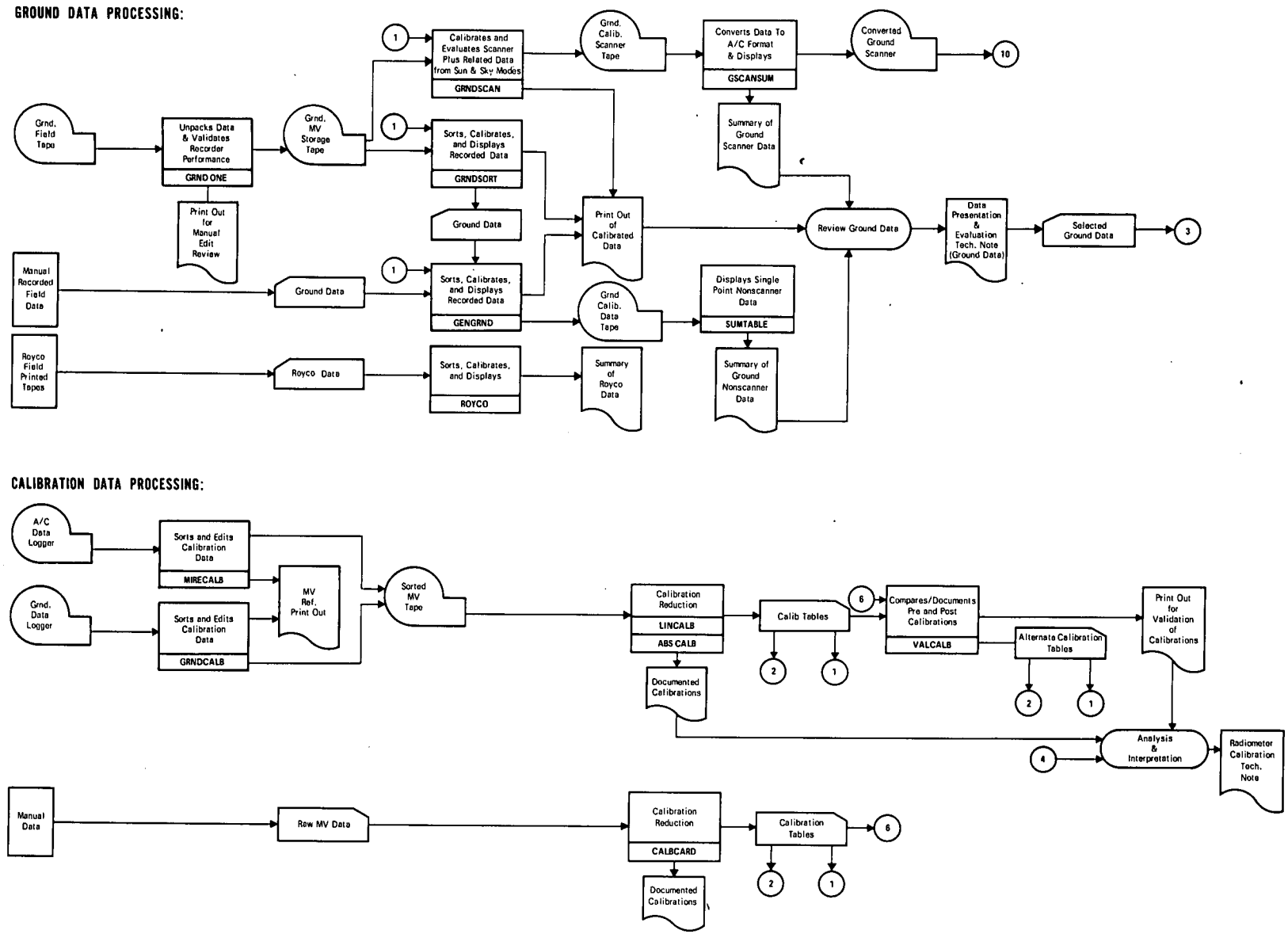


Fig. 5-2. Atmospheric Visibility Program Data Processing Schedule.

5.2. GROUND-BASED DATA

Only the CRM and NEPH systems were used for the collection of ground-based data and their outputs were manually recorded. Due to the relatively small quantities of ground data acquired during OPAQUE IV, minimal automatic processing has been required.

5.3. CALIBRATION DATA

The calibration data are the heart of the data processing system in that any data processed are only as good as the calibrations applied to them. The pre- and post-deployment calibration data are recorded on tape in an effort to eliminate the human bias and are handled in a phased procedure similar to that used in the general data processing technique. The data can be recorded on either the airborne or the ground data logging system. In an initial procedure, these data go through Program MIRECALB or GRNDCALB, according to the recording system used, to verify the electrical quality of the radiometer data and associated monitored parameters. For final processing, the data are sorted and stored in set fashion.

The details of processing the calibration data according to the procedure illustrated in Fig. 5-2 are described in our preceding reports, AFCRL-72-0593, Duntley, *et al.* (1972c), AFCRL-TR-75-0457, Duntley, *et al.* (1975a) and AFCRL-TR-75-0414, Duntley, *et al.* (1975b), and will not therefore be discussed further herein.

5.4. DATA TAPES

The data processing sequences referenced in the previous paragraphs produce output tapes containing a broad catalog of calibrated data. These tapes are useable as data inputs to a multiplicity of diverse problems requiring a knowledge of atmospheric optical properties. To simplify future retrieval, the data tape numbers, and the in-house descriptions of the data reported herein have been summarized in Table 5.1.

Table 5.1. Data Library Composite Tape Summary

OPAQUE IV Flight No.	DIOGEDIT Tape No. VL-393K File No.	Data Presentation No.	Edited Properties No.
C-430	1	157a	158a
C-431	2	157a	158a
C-432	3	157a	158a
C-433	4	157a	158a
C-434	5	157a	158a
C-435	6	157b	158b
C-436	7	157b	158b
C-437	8	157b	158b
C-438	9	157b	158b
C-439	10	157b	158b
C-440	11	157b	158b
C-441	12	157b	158b
C-442	13	157c	158c
C-443	14	157c	158c
C-444	15	157c	158c

Table 5.1. (Cont.)

OPAQUE IV Flight No.	DIOGEDIT Tape No. VL-393K File No.	Data Presentation No.	Edited Properties No.
C-445	16	157c	158c
C-446	17	157c	158c
C-447	18	157c	158c
C-448	19	157c	158c
C-449	20	157c	158c
C-450A	21	157d	158d
C-450B	22	157d	158d
C-451	23	157d	158d
C-452	24	157d	158d
C-453	25	157d	158d
C-454	26	157d	158d
C-455	No Data		
C-456A	27	157d	158d
C-456B	28	157d	158d

6. WEATHER SUMMARY

6.1. INTRODUCTION AND GRAPHICS

Meteorological data available for analysis were provided by the Environmental Technical Applications Center (ETAC) at Scott Air Force Base. These data included daily surface and 500-millibar charts, surface observations, pilot reports, satellite photographs, vertical cross sections, and radiosonde data. Northern hemisphere surface charts for 0000 GMT and 1200 GMT and 500-millibar charts for 1200 GMT prepared by the National Oceanographic and Atmospheric Administration were obtained from the National Climatic Center in Asheville. Portions of the 1200 GMT surface charts have been reproduced as Fig. 6-1. The approximate flight track locations are indicated in Fig. 6-1 with the character ★. A later section includes tabular data of the hourly observations from stations in the vicinity of the flight track.

Airborne measurements of temperature and computed values of relative humidity, as derived from these measurements and simultaneous measurements of dewpoint temperature, are presented in Fig. 6-2 and 6-3. The temperatures were measured continuously by an AN/AMQ-17 aerograph system described briefly in AFCRL-70-0137, Duntley, *et al.* (1970a) and more completely in USNAF TP-133. The dewpoint/frostpoint temperatures were measured using a Cambridge 137-C3 Aircraft Hygrometer System which is described briefly in AFCRL-72-0593, Duntley, *et al.* (1972c).

The profile identification symbols used in Figs. 6-2 and 6-3 are related to the spectral filter sequence during which the data were measured; i.e., the temperature profile identified with the Filter 2 symbol was taken during the same time interval as the Filter 2 radiometric measurements; the temperatures coded as Filter 3 were taken simultaneously with the Filter 3 radiometric measurements, etc. Table 6.1, abstracted from program FLTDOC listings, summarizes the beginning and ending times associated with each flight element during which these meteorological and radiometric measurements were made. The time separations between profiles are substantial and should be carefully considered when assessing the temporal stability of the subject airmass.

Radiosonde observations for 1200 GMT were available from sites near each of the flight tracks. At some locations radiosonde data for 0000 GMT and/or 0600 GMT were also available. The temperatures from the radiosonde station closest in time and location to each flight track have been plotted on the temperature plots in Fig. 6-2. The relative humidities, computed from RAOB temperature and dewpoint depression measurements are also shown on the plots in Fig. 6-3. The locations of the radiosonde stations are shown on the data site detail maps in Fig. 1-1. More detailed location information as well as the station identification code used in Fig. 6-2 and 6-3 is included in Table 6.2. Although the RAOB data are graphed with the C-130 data, it should be remembered that the two data sets are often remote in either space or time. Weather and traffic conditions often induce three to four miles of variability in the location of each day's flight track. Thus only approximate track-RAOB geographical separations are indicated in the flight descriptions of Section 7.3 and in Table 6.2. The time separations may be determined by comparing the flight times noted in Tables 6.1 and 7.3 with the RAOB release time noted in Table 6.2.

Table 6.1. Flight Profile Elapsed Time Summary (GMT)

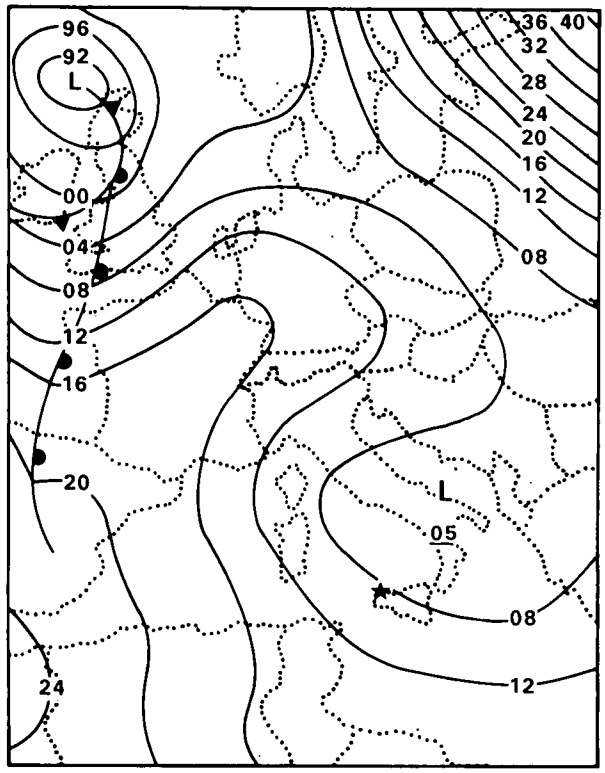
Flight No.	Date (1978)	Profile Flight Times (GMT)								Total Time Elapsed (V-PRO Only)	
		Filter 2		Filter 3		Filter 4		Filter 5			
		Start	Stop	Start	Stop	Start	Stop	Start	Stop	Hours	Minutes
C-430	31 Jan	1449	1506	1512	1531	1536	1553	1558	1614	1	25
C-431	1 Feb	1047	1148	1159	1212	1232	1300	1332	1340	2	53
C-432	3 Feb	1324	1344	1354	1412	1229	1252	1256	1314	1	43
C-433	17 Feb	1211	1217	1224	1232	1236	1246	1250	1259	0	48
C-434	18 Feb	0956	1050	1107	1126	1149	1246	1306	1325	3	29
C-435	23 Feb	0843	0850	0913	0921	0941	0949	1010	1015	1	32
C-436	23 Feb	1336	1342	1357	1403	1426	1431	1446	1452	1	16
C-437	27 Feb	0953	1056	1114	1126	1153	1258	1314	1326	3	33
C-438	1 Mar	0917	0922	-	-	-	-	-	-	0	05
C-439	1 Mar	1257	1301	1320	1328	1352	1357	1417	1424	1	27
C-440	2 Mar	1315	1411	1441	1453	1116	1217	1235	1252	3	37
C-441	3 Mar	1510	1531	1536	1552	1600	1619	1626	1641	1	31
C-442	9 Mar	1245	1258	1304	1320	1330	1344	1349	1402	1	17
C-443	9 Mar	1424	1427	1447	1453	1511	1515	1532	1537	1	13
C-444	11 Mar	1313	1342	1404	1411	1432	1457	1515	1521	2	08
C-445	13 Mar	1117	1131	1137	1150	1156	1203	1208	1213	0	56
C-446	15 Mar	1130	1135	1154	1158	1216	1219	1234	1238	1	08
C-447	15 Mar	1249	1300	1328	1340	1347	1359	1404	1414	1	25
C-448	17 Mar	1120	1143	1149	1206	1214	1235	1241	1257	1	37
C-449	18 Mar	0958	1049	1108	1122	1139	1242	1259	1316	3	18
C-450A	22 Mar	0948	1000	1008	1020	1026	1037	1044	1054	1	06
C-450B	22 Mar	1114	1117	1133	1136	1201	1205	1223	1227	1	13
C-451	22 Mar	1311	1322	1329	1340	1346	1358	1405	1416	1	05
C-452	23 Mar	1431	1448	1457	1514	1520	1523	1533	1536	1	05
C-453	28 Mar	0846	0853	0901	0913	0920	0929	0938	0949	1	03
C-454	28 Mar	1059	1147	1203	1213	1229	1319	1336	1346	2	47
C-456A	31 Mar	1316	1320	1337	1340	1357	1359	1415	1416	1	00
C-456B	31 Mar	1432	1441	1448	1456	1505	1515	1523	1532	1	00

Table 6.2. Radiosonde Station Identification

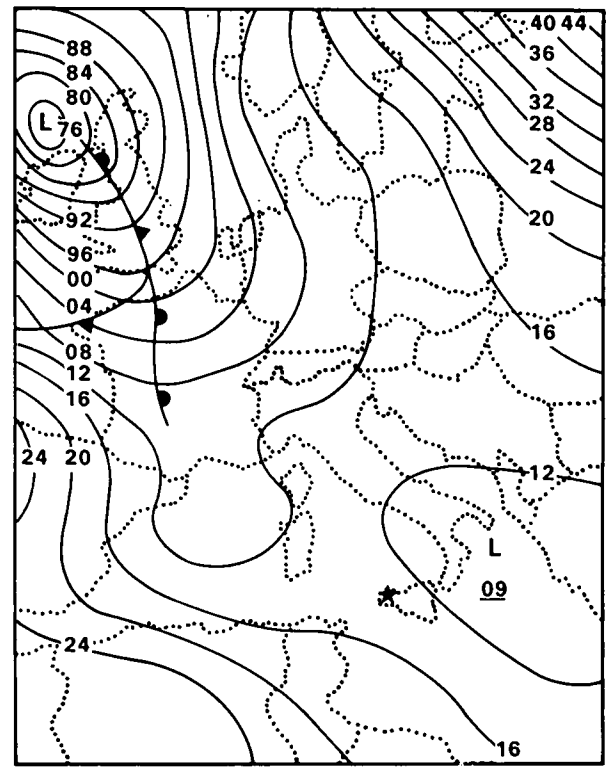
Flight No.	Track Identification	Radiosonde Station	Range and Direction from Track Center	Fig. 6-1 & 6-2 Identification Code	RAOB Time GMT
C-430	Trapani	Trapani	41 Km NE	RAOB T	1200
C-431	Trapani	Trapani	41 Km NE	RAOB T	1200
C-432	Trapani	Trapani	41 Km NE	RAOB T	1200
C-433	Sigonella	Trapani	254 Km NW	RAOB T	1200
C-434	Sigonella	Trapani	254 Km NW	RAOB T	1200
C-435	Birkhof	Neuchatel	225 Km SW	RAOB N	1200
C-436	Birkhof	Neuchatel	225 Km SW	RAOB N	1200
C-437	Birkhof	Neuchatel	225 Km SW	RAOB N	1200
C-438	Birkhof	Neuchatel	225 Km SW	RAOB N	1200
C-439	Birkhof	Neuchatel	225 Km SW	RAOB N	1200
C-440	Birkhof	Neuchatel	225 Km SW	RAOB N	1200
C-441	Birkhof	Neuchatel	225 Km SW	RAOB N	1200
C-442	Mildenhall	Crawley	178 Km SW	RAOB C	1200
C-443	Mildenhall	Crawley	178 Km SW	RAOB C	1200

Table 6.2. (Cont.) Radiosonde Station Identification

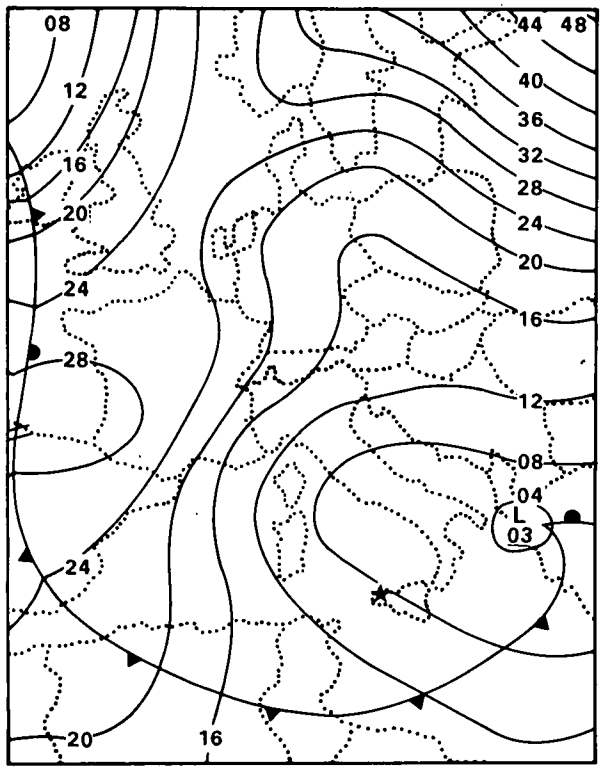
Flight No.	Track Identification	Radiosonde Station	Range and Direction from Track Center	Fig. 6-1 & 6-2 Identification Code	RAOB Time GMT
C-444	Yeovilton	Crawley	157 Km E	RAOB C	1200
C-445	Soesterberg	DeBilt	32 Km NW	RAOB D	1200
C-446	Yeovilton	Crawley	157 Km E	RAOB C	1200
C-447	Yeovilton	Crawley	157 Km E	RAOB C	1200
C-448	Yeovilton	Crawley	157 Km E	RAOB C	1200
C-449	Yeovilton	Crawley	157 Km E	RAOB C	1200
C-450	Soesterberg	DeBilt	32 Km NW	RAOB D	1200
C-451	Meppen	Bergen	149 Km E	RAOB B	1200
C-452	Meppen	Bergen	149 Km E	RAOB B	1200
C-453	Meppen	Bergen	149 Km E	RAOB B	1200
C-454	Rodby	Schleswig	102 Km W	RAOB S	1200
C-456A	Rodby	Schleswig	102 Km W	RAOB S	1200
C-456B	Rodby	Schleswig	102 Km W	RAOB S	1200



C-430 31 JAN 1978 1200 GMT



C-431 1 FEB 1978 1200 GMT



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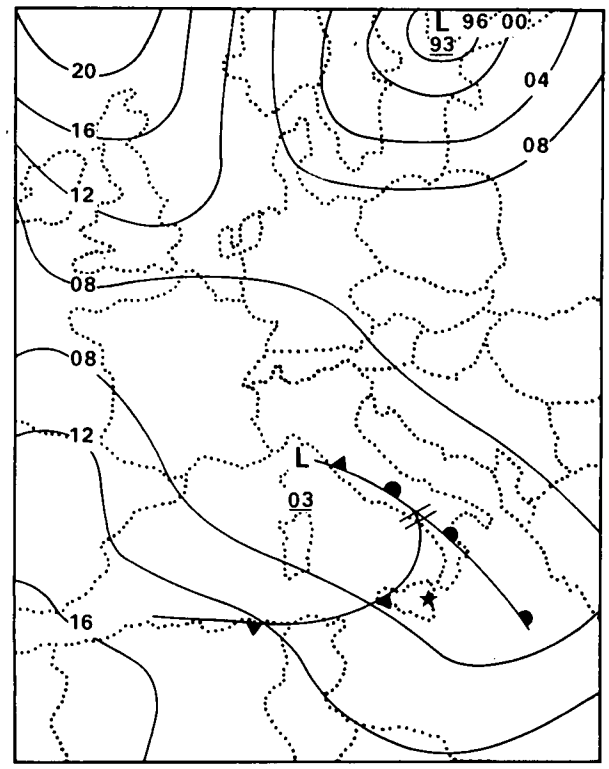
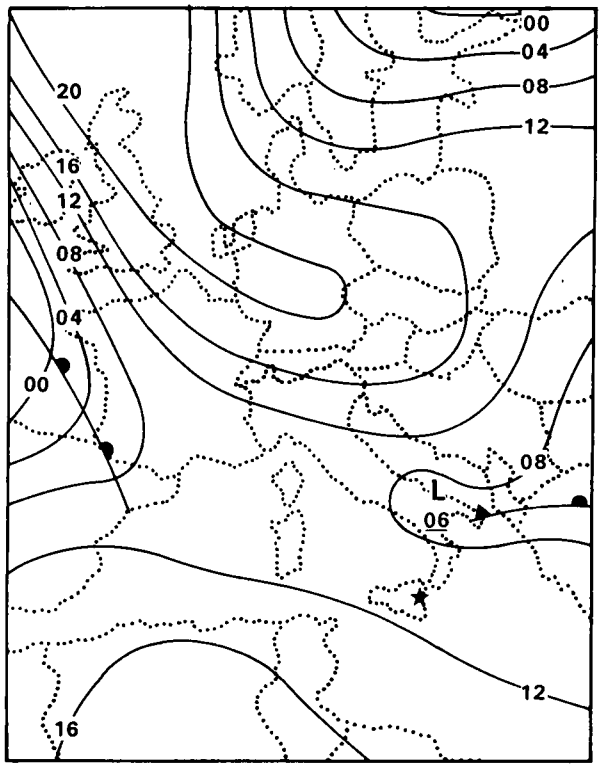
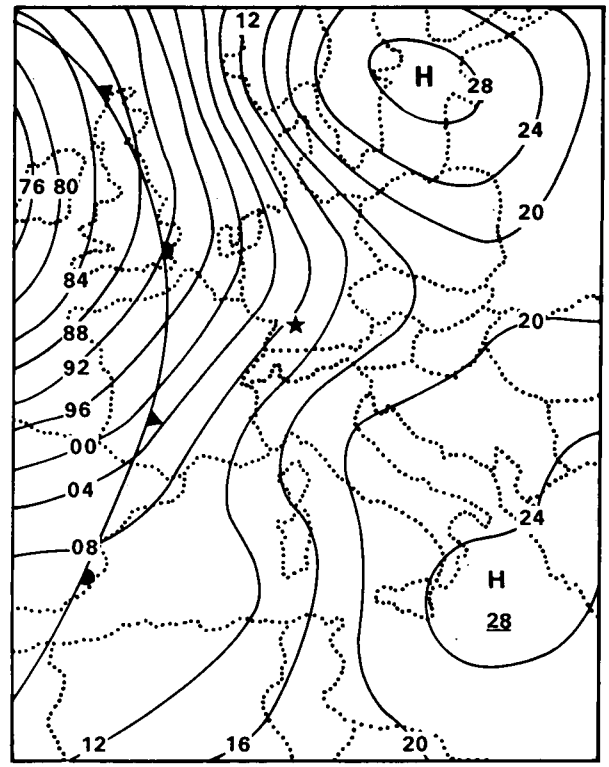


C-433 17 FEB 1978 1200 GMT

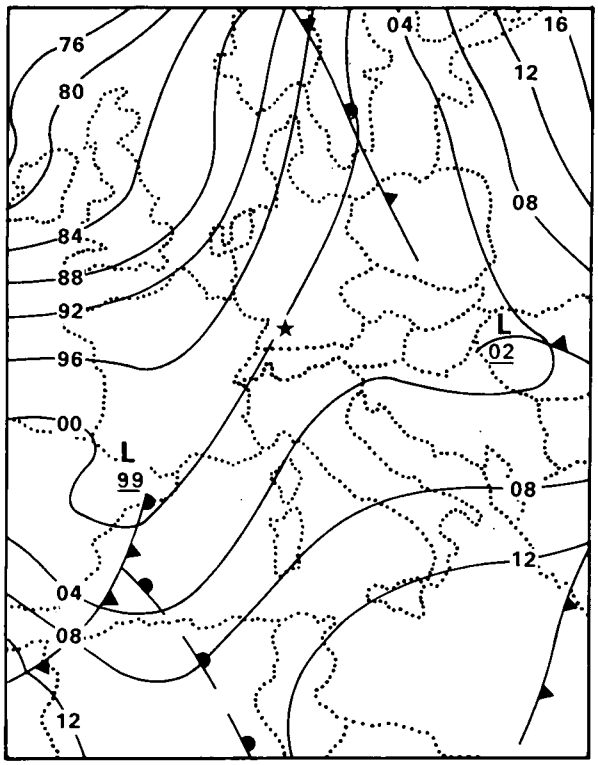
Fig. 6-1a. Synoptic Surface Charts for European Area During Project OPAQUE IV



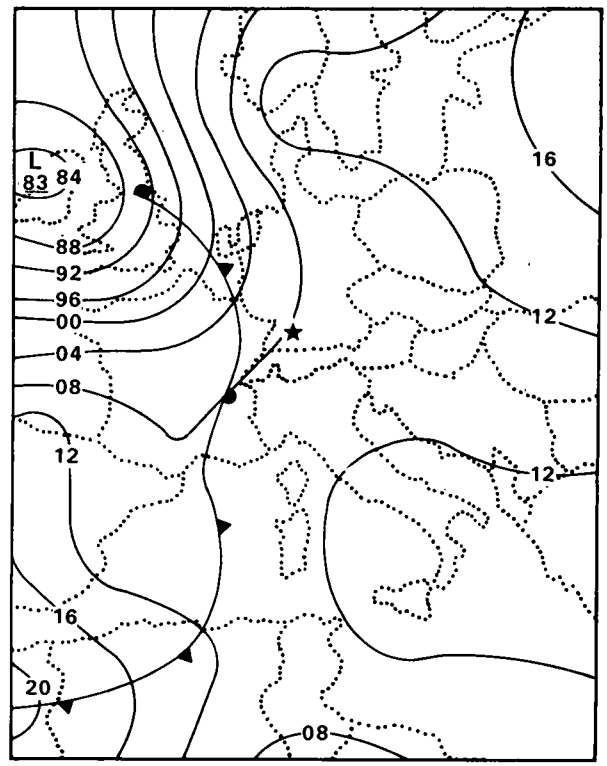
C-434 18 FEB 1978 1200 GMT



C-435 & C-436 23 FEB 1978 1200 GMT

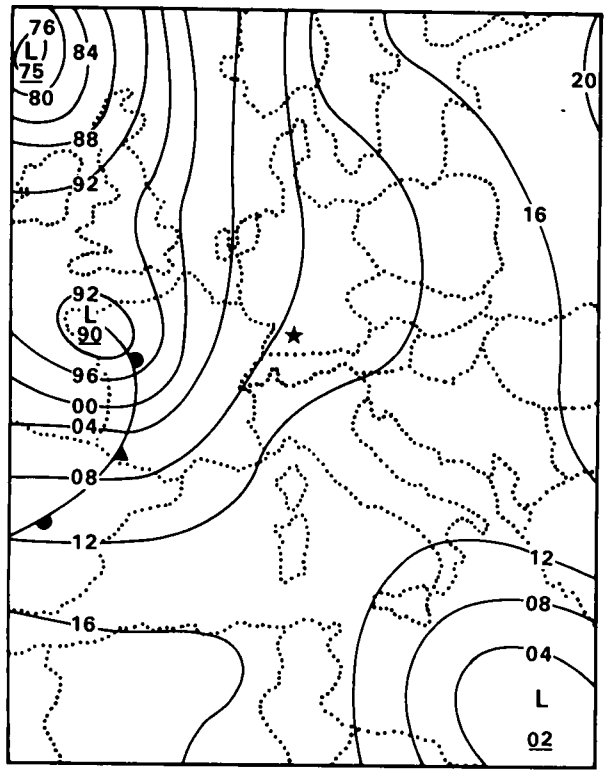


C-437 27 FEB 1978 1200 GMT

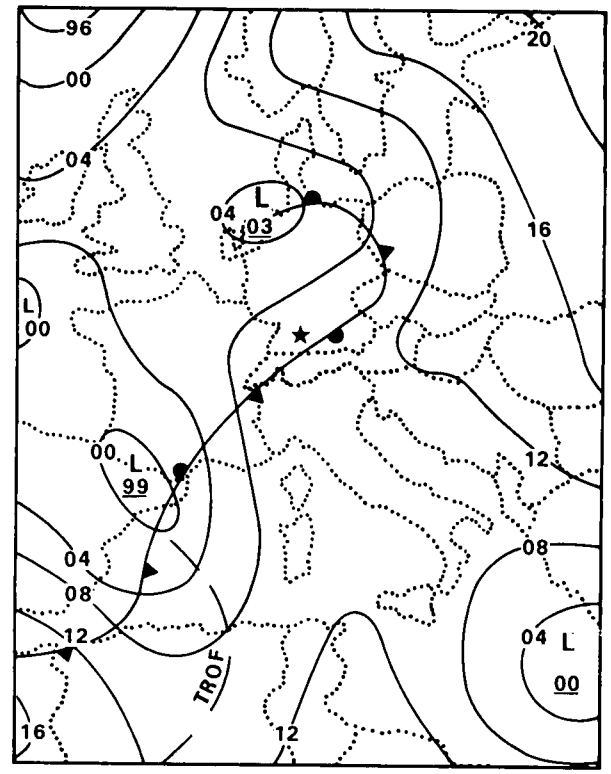


C-438 & C-439 1 MAR 1978 1200 GMT

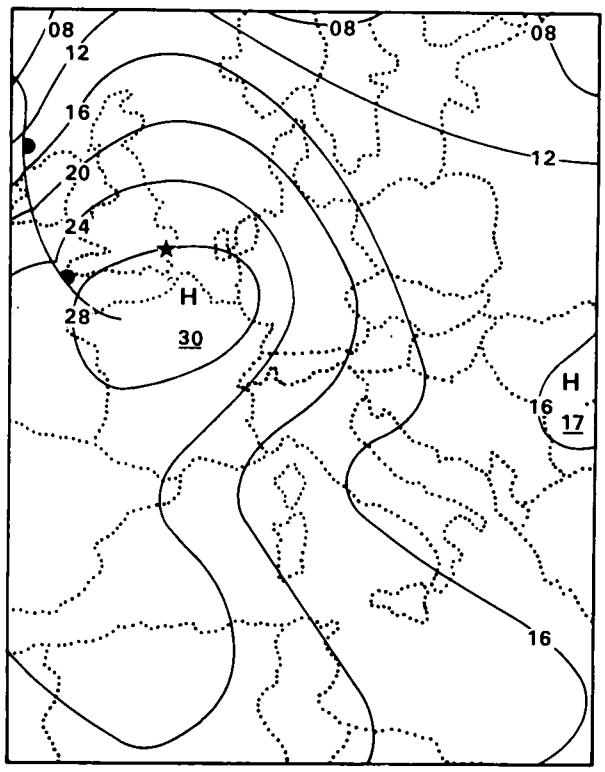
Fig. 6-1b. Synoptic Surface Charts for European Area During Project OPAQUE IV



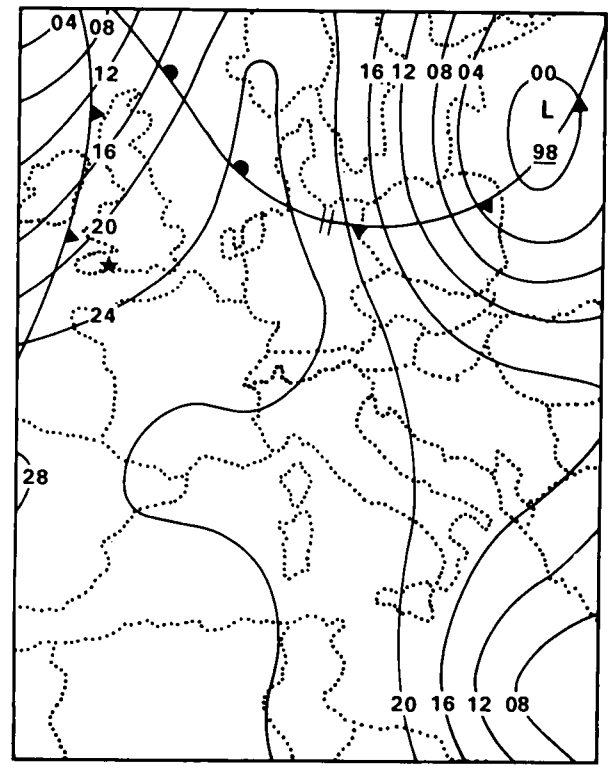
C-440 2 MAR 1978 1200 GMT



C-441 3 MAR 1978 1200 GMT

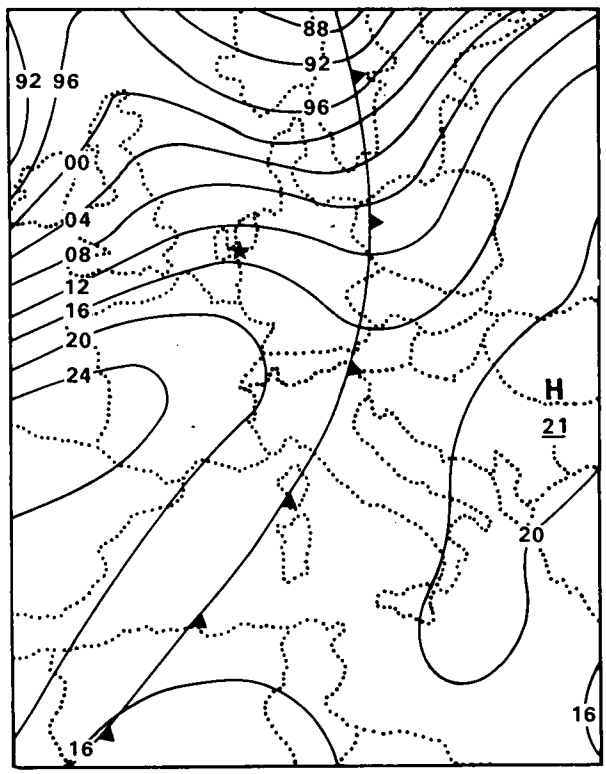


C-442 & C-443 9 MAR 1978 1200 GMT

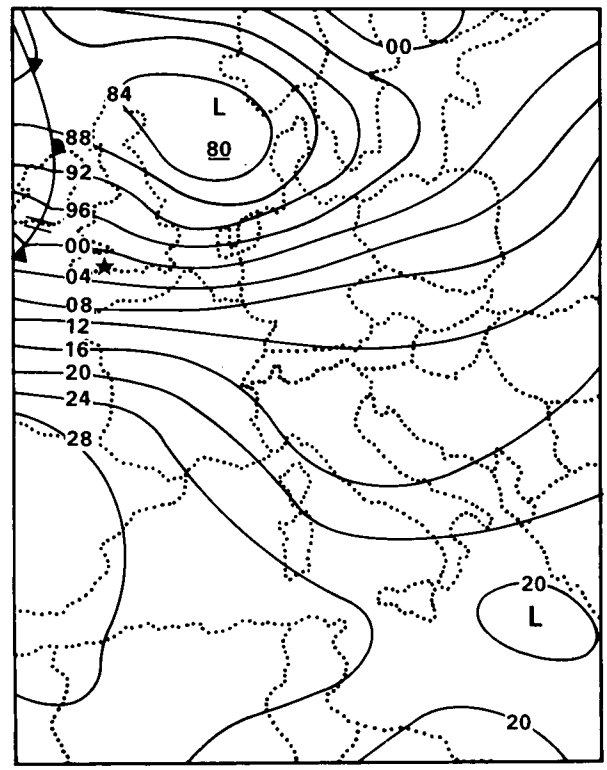


C-444 11 MAR 1978 1200 GMT

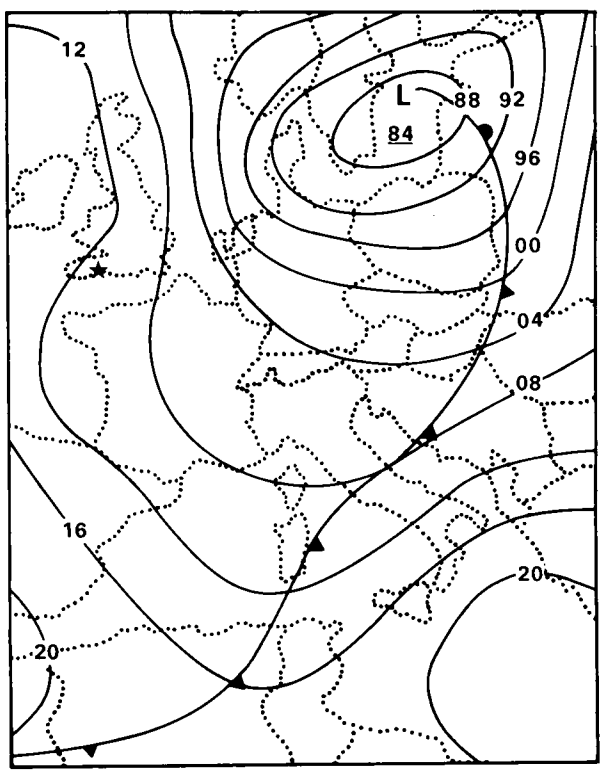
Fig. 6-1c. Synoptic Surface Charts for European Area During Project OPAQUE IV



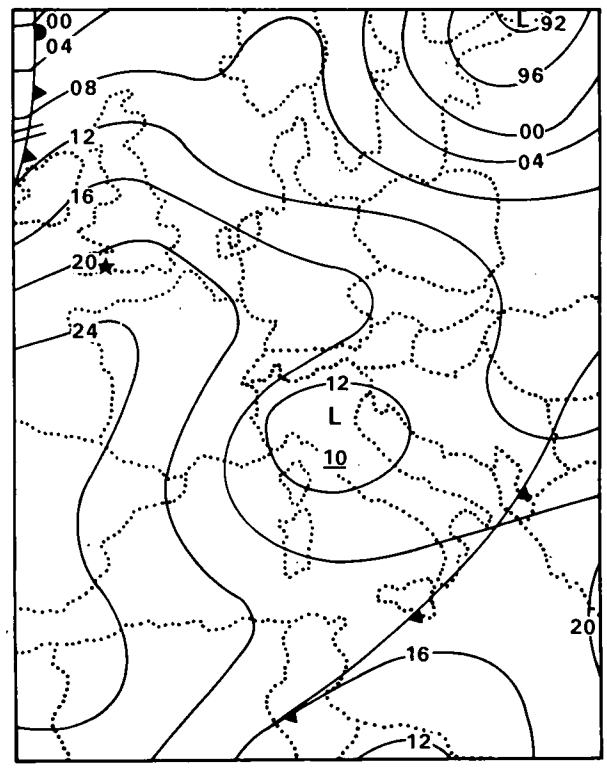
C-445 13 MAR 1978 1200 GMT



C-446 & C-447 15 MAR 1978 1200 GMT

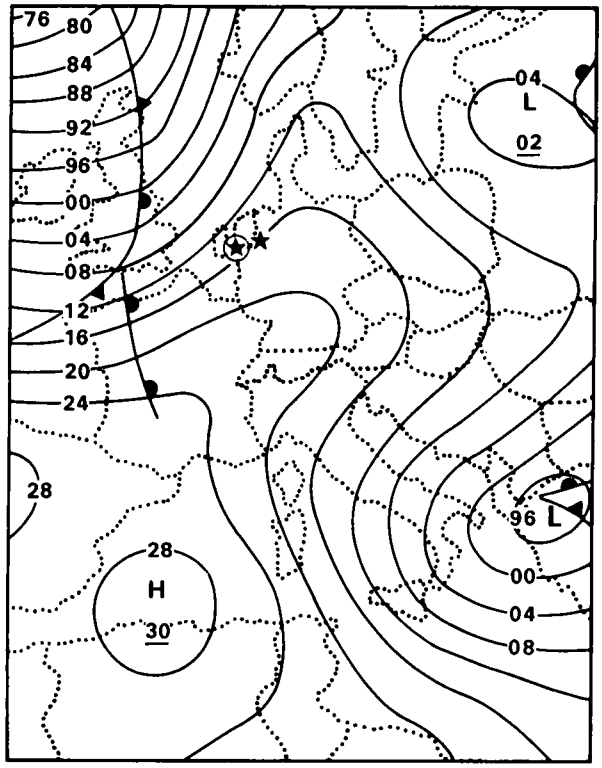


C-448 17 MAR 1978 1200 GMT

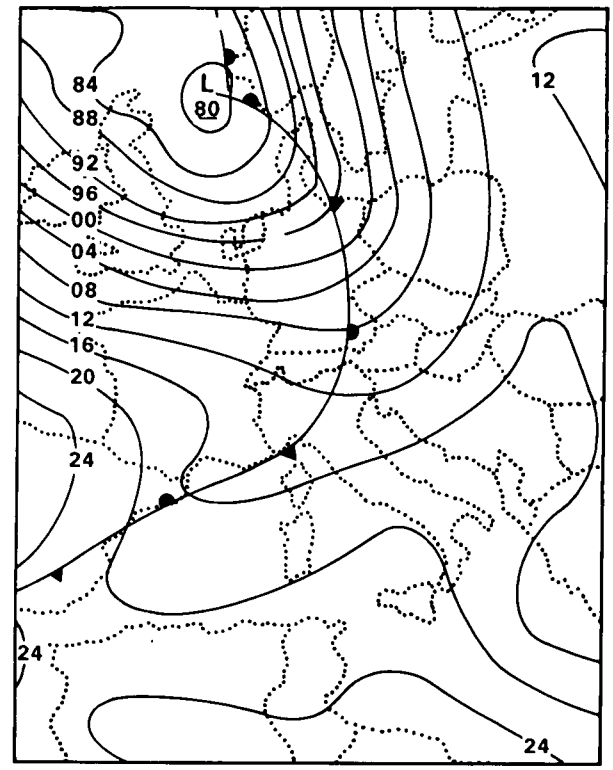


C-449 18 MAR 1978 1200 GMT

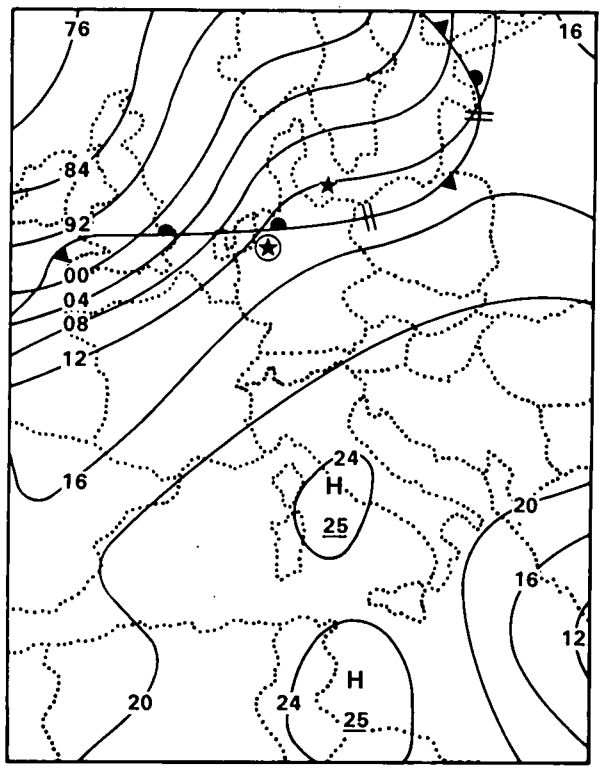
Fig. 6-1d. Synoptic Surface Charts for European Area During Project OPAQUE IV



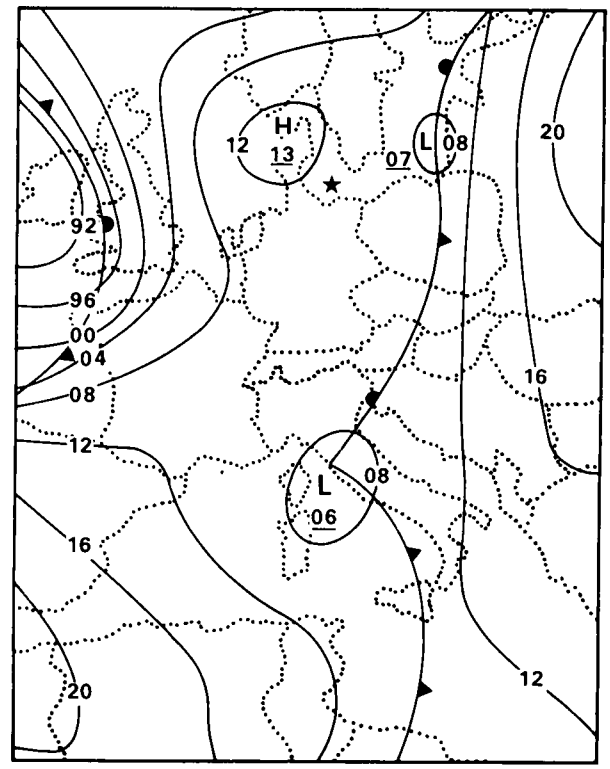
C-450 & C-451 22 MAR 1978 1200 GMT



C-452 23 MAR 1978 1200 GMT



C-453 & C-454 28 MAR 1978 1200 GMT



C-456A & C-456B 31 MAR 1978 1200 GMT

Fig. 6-1e. Synoptic Surface Charts for European Area During Project OPAQUE IV

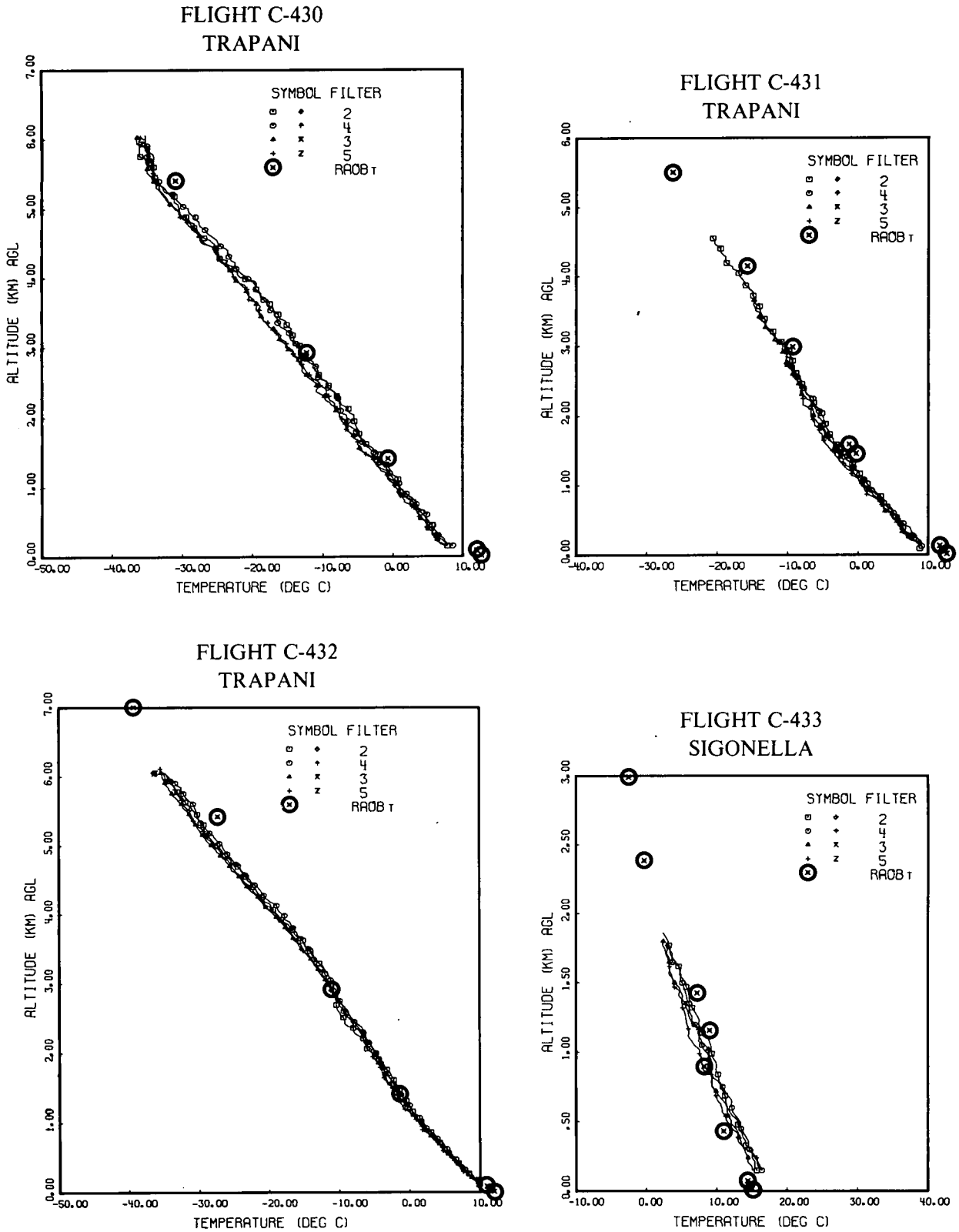


Fig. 6-2a. Temperature Versus Altitude for 26 Project OPAQUE IV Flights.

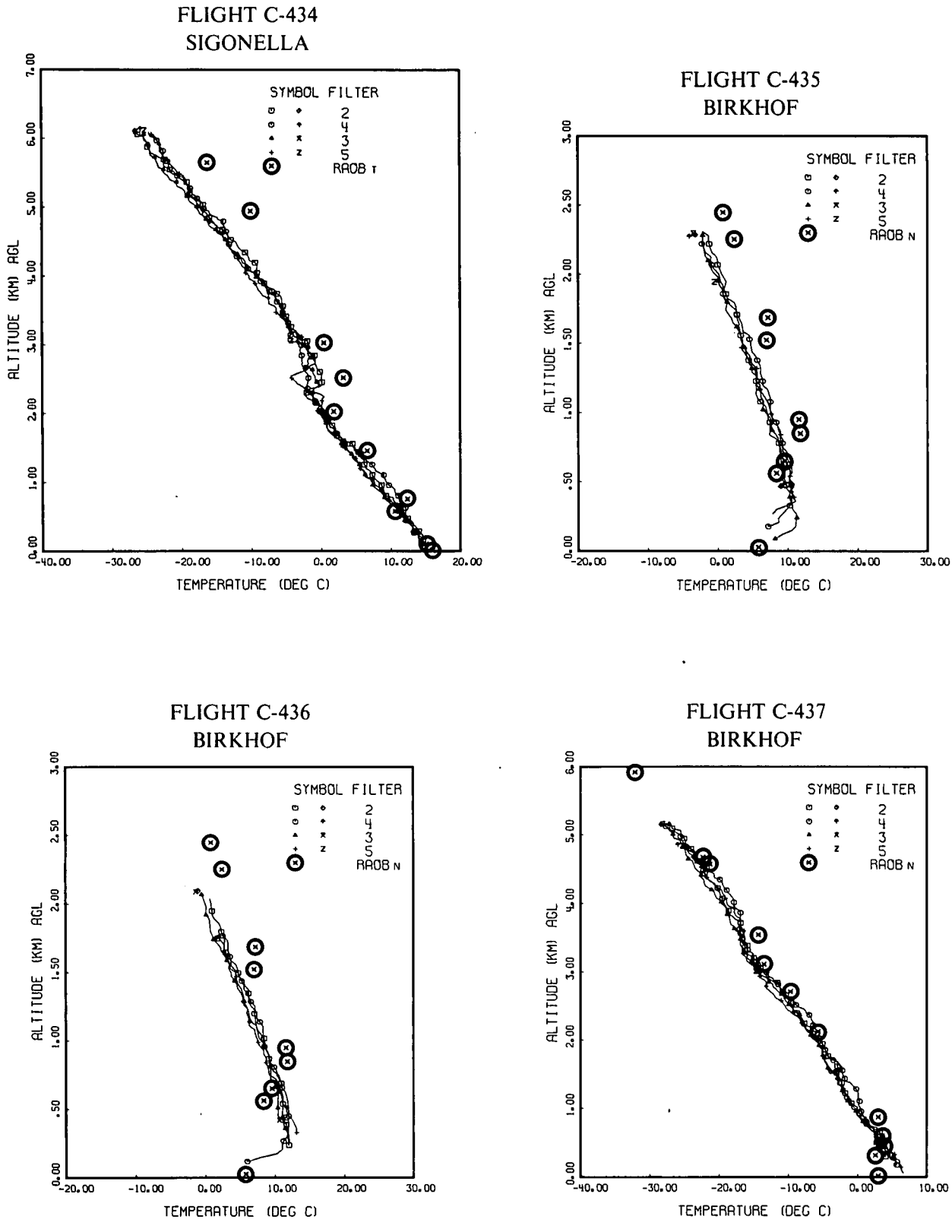
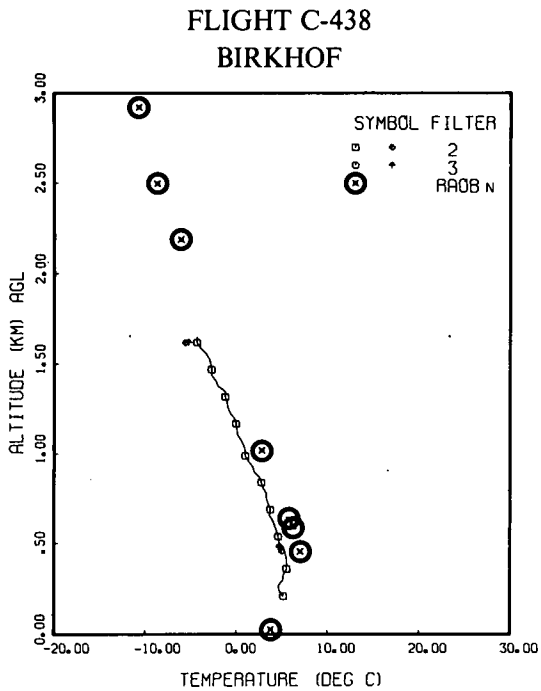
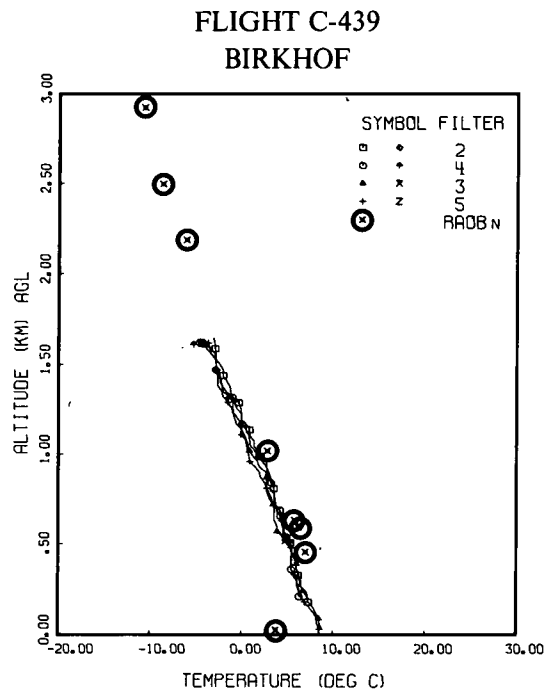
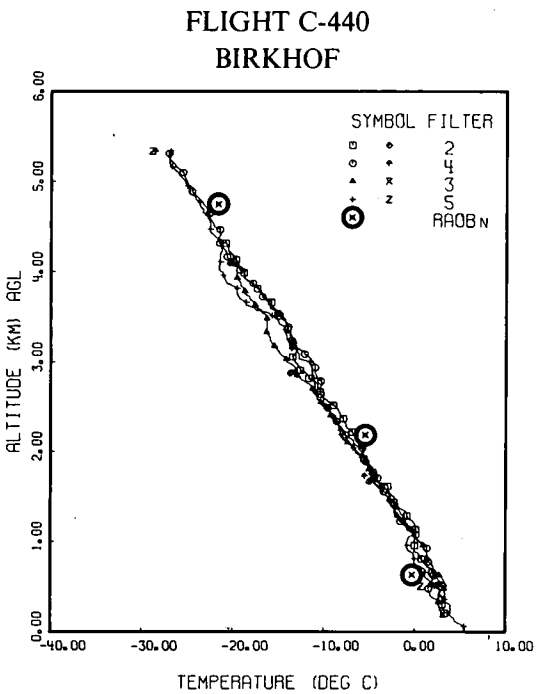


Fig. 6-2b. Temperature Versus Altitude for 26 Project OPAQUE IV Flights.







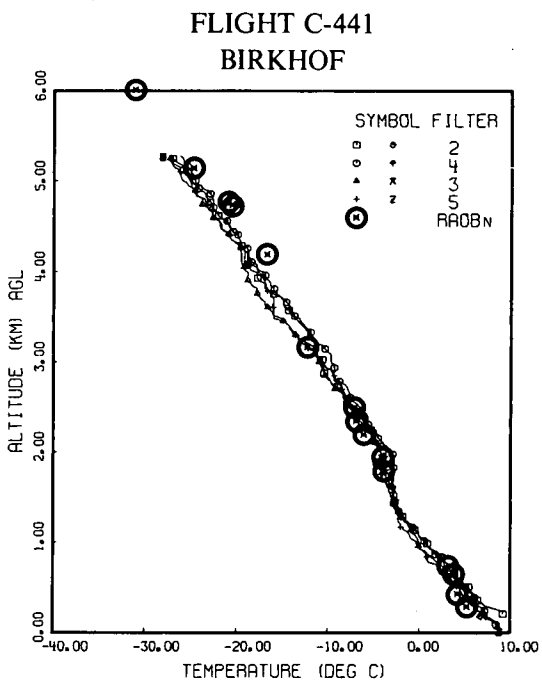


Fig. 6-2c. Temperature Versus Altitude for 26 Project OPAQUE IV Flights.

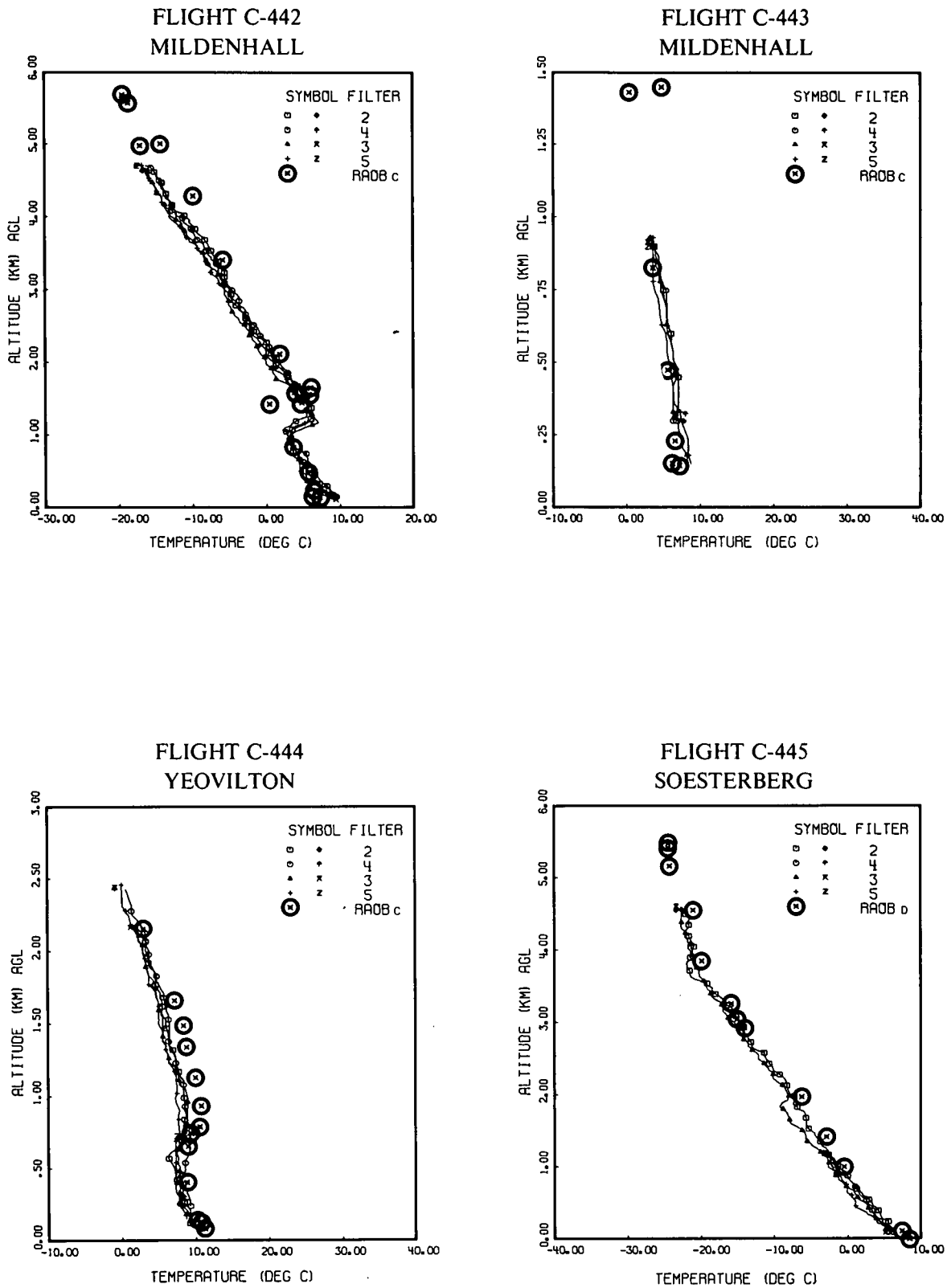


Fig. 6-2d. Temperature Versus Altitude for 26 Project OPAQUE IV Flights.

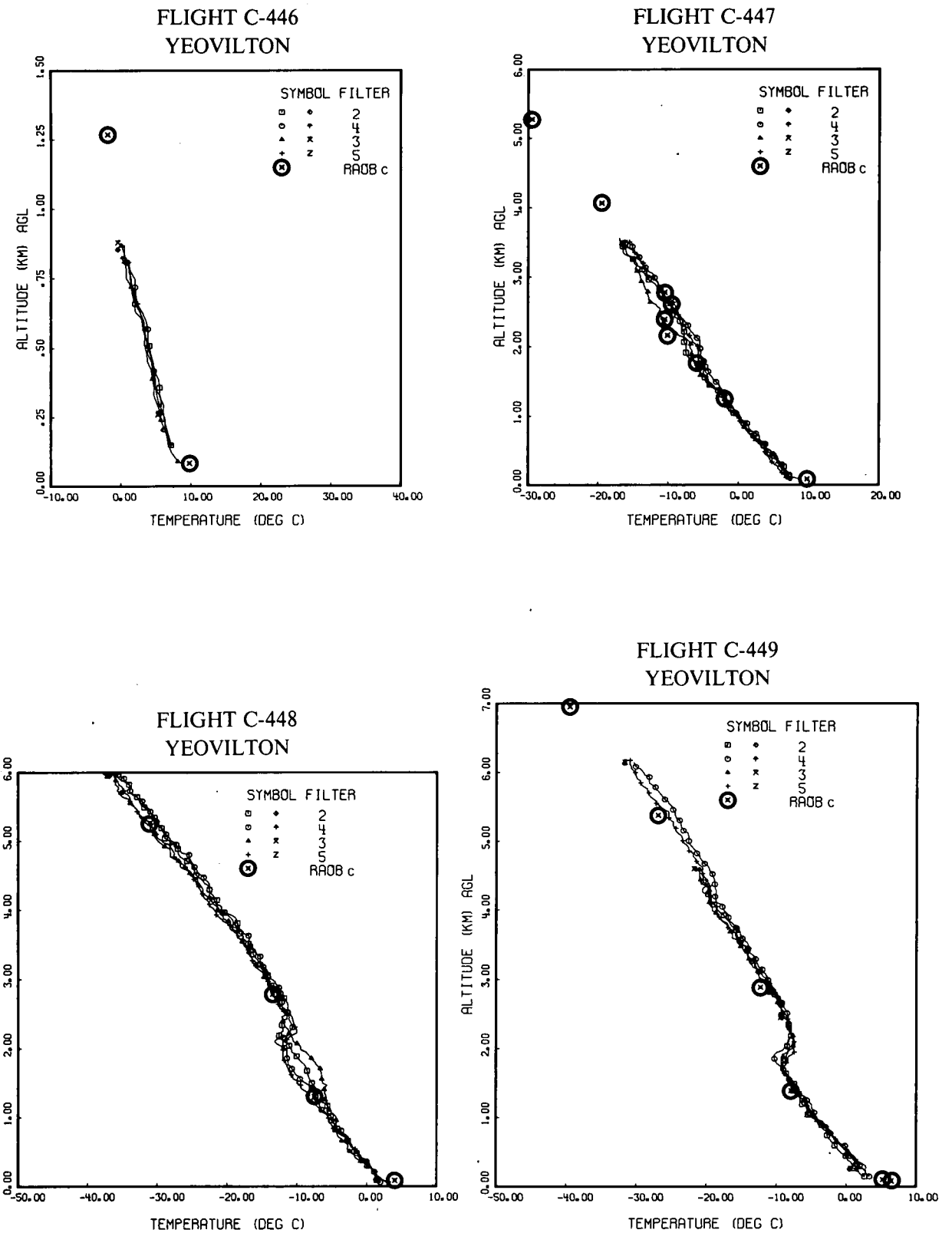
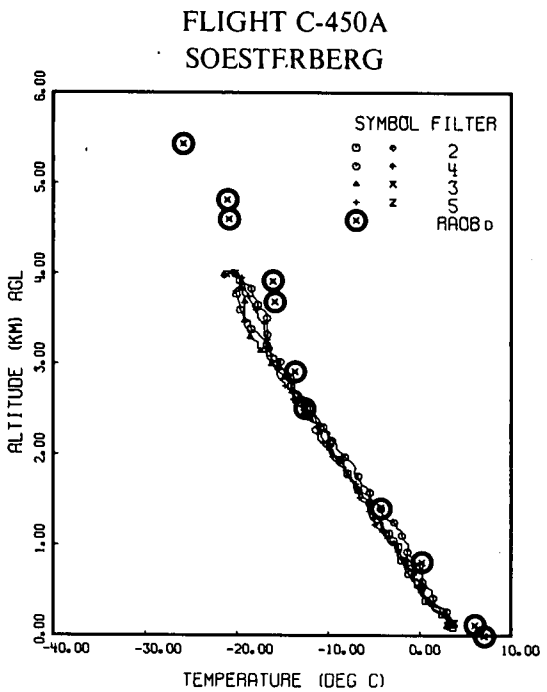
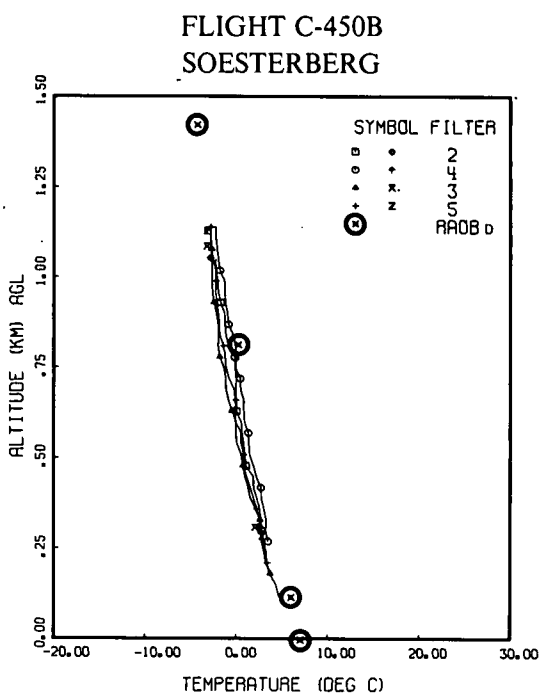
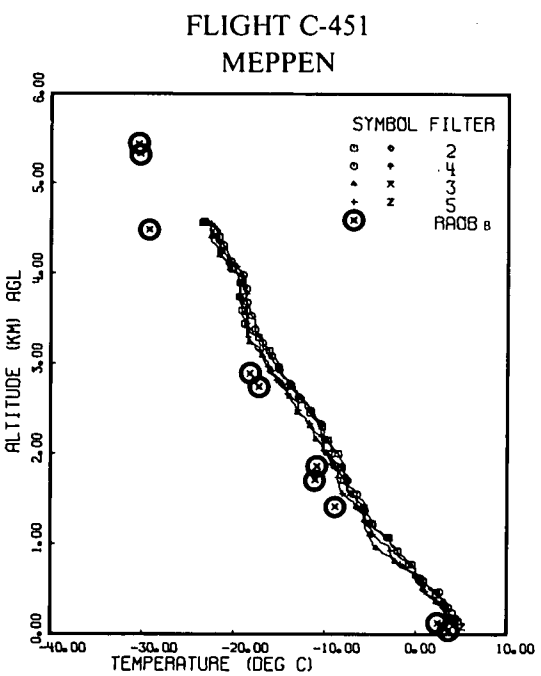


Fig. 6-2e. Temperature Versus Altitude for 26 Project OPAQUE IV Flights.







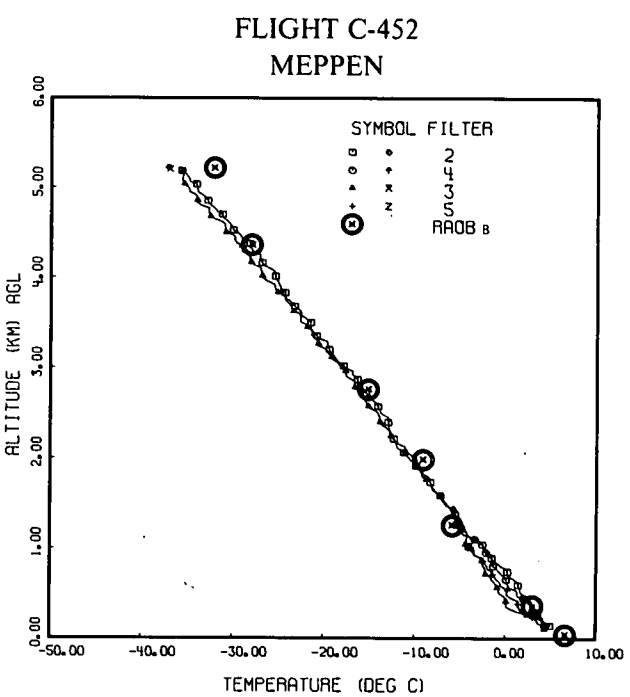
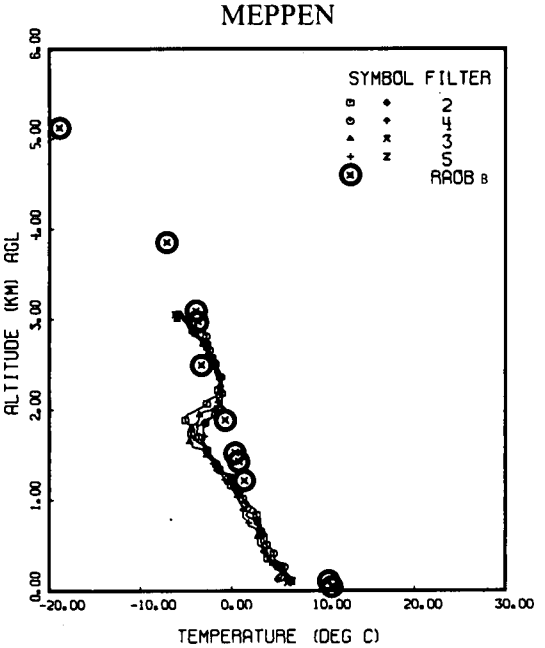
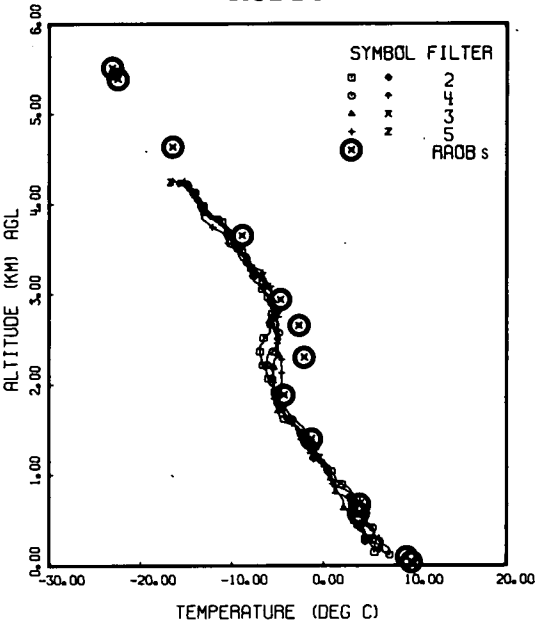


Fig. 6-2f. Temperature Versus Altitude for 26 Project OPAQUE IV Flights.

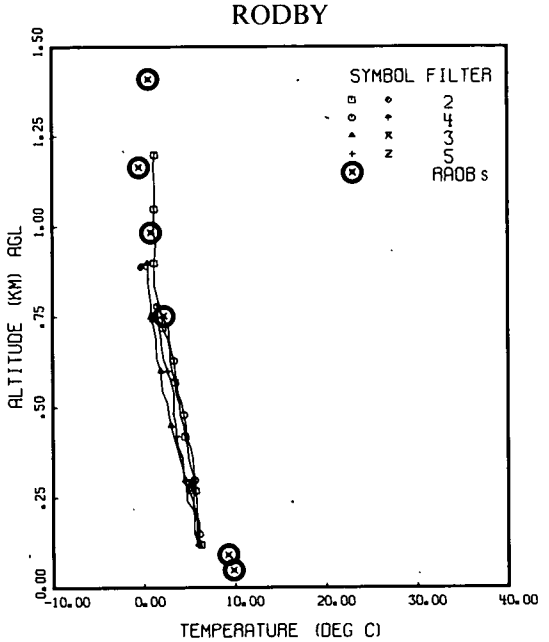
FLIGHT C-453
MEPPEN



FLIGHT C-454
RODBY



FLIGHT C-456A
RODBY



FLIGHT C-456B
RODBY

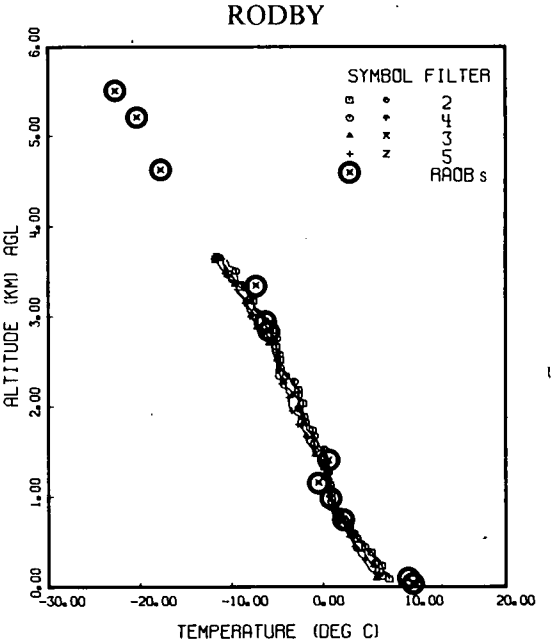


Fig. 6-2g. Temperature Versus Altitude for 26 Project OPAQUE IV Flights.

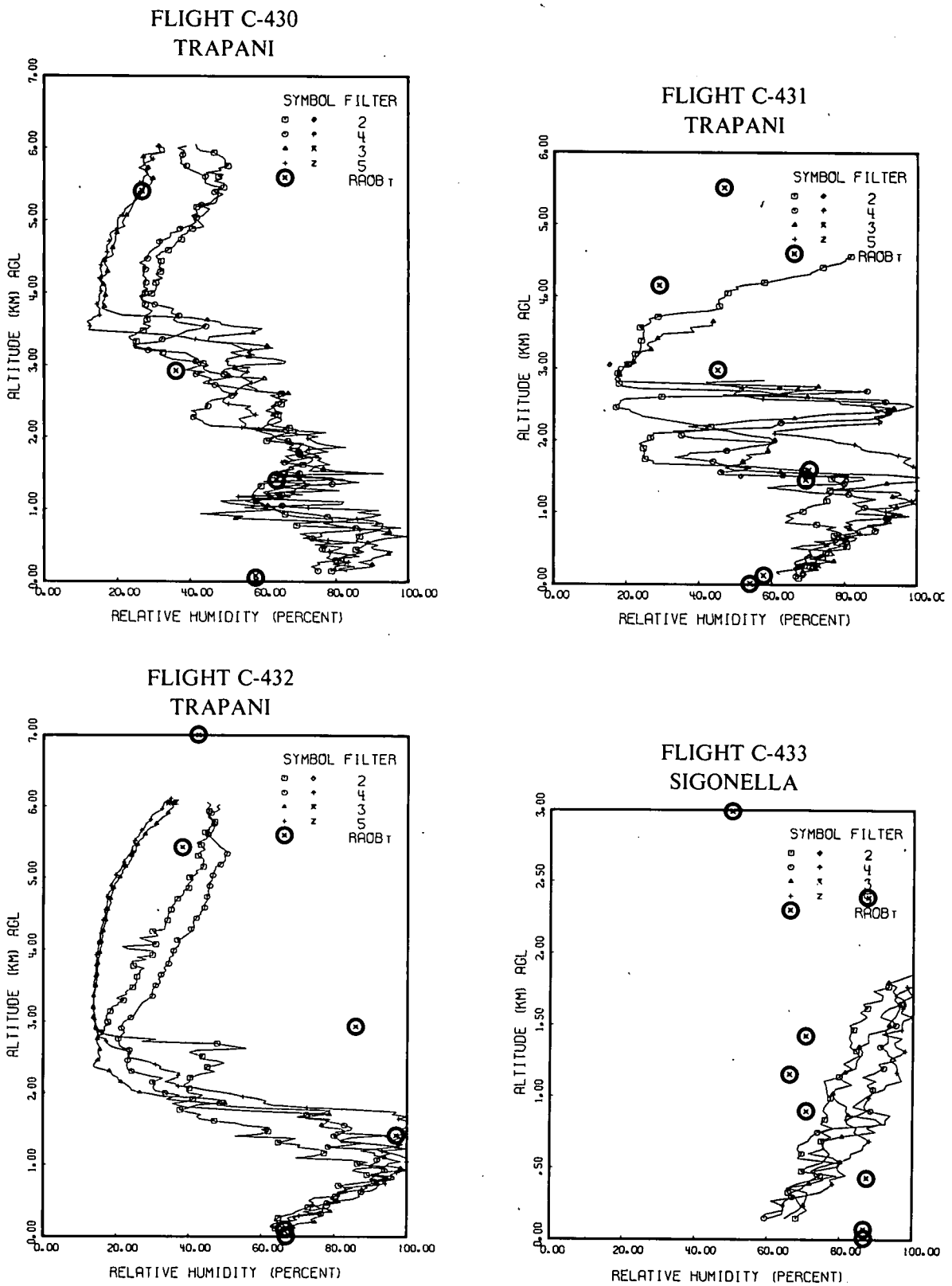


Fig. 6-3a. Relative Humidity Versus Altitude for 26 Project OPAQUE IV Flights.

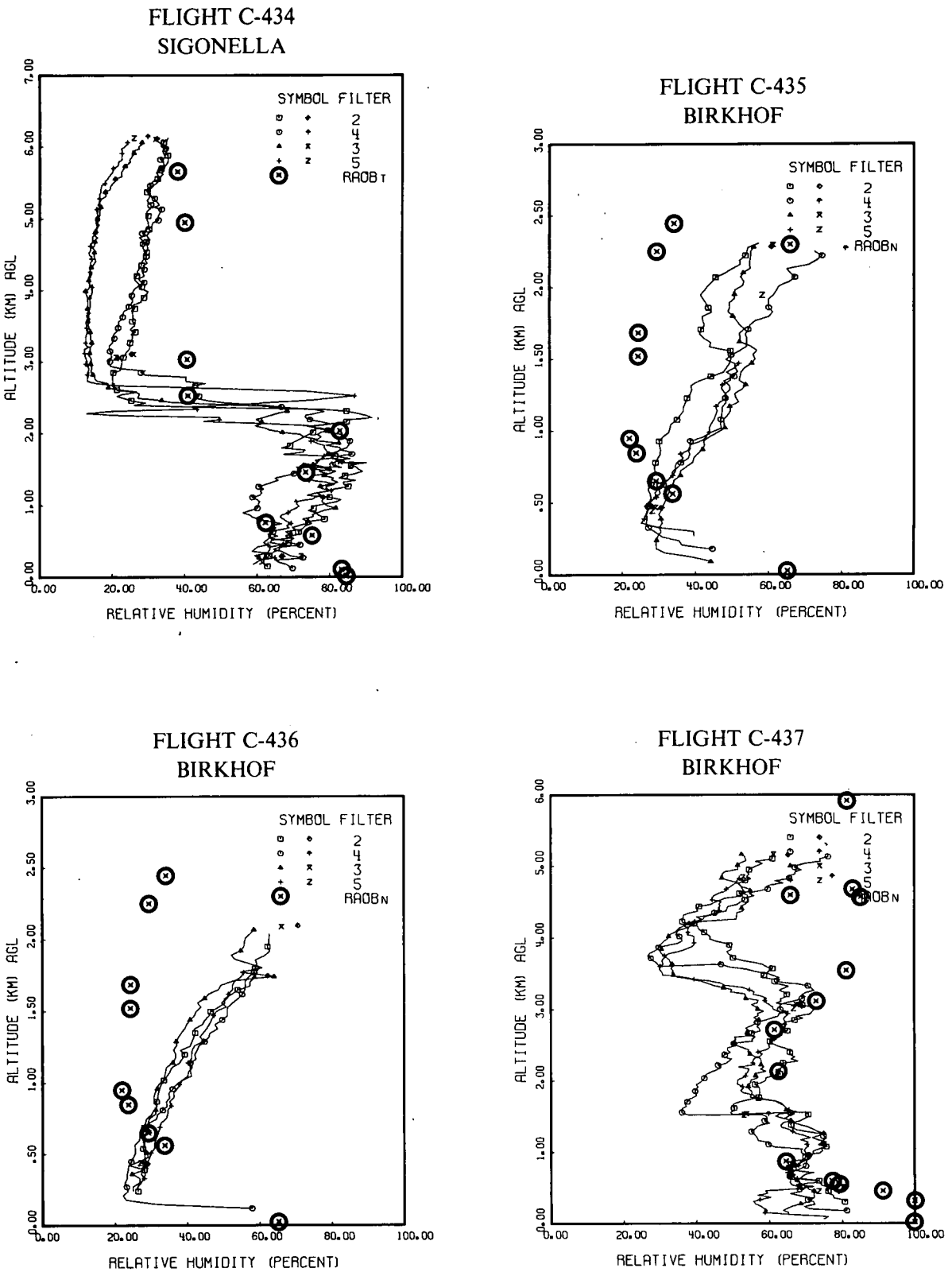


Fig. 6-3b. Relative Humidity Versus Altitude for 26 Project OPAQUE IV Flights.

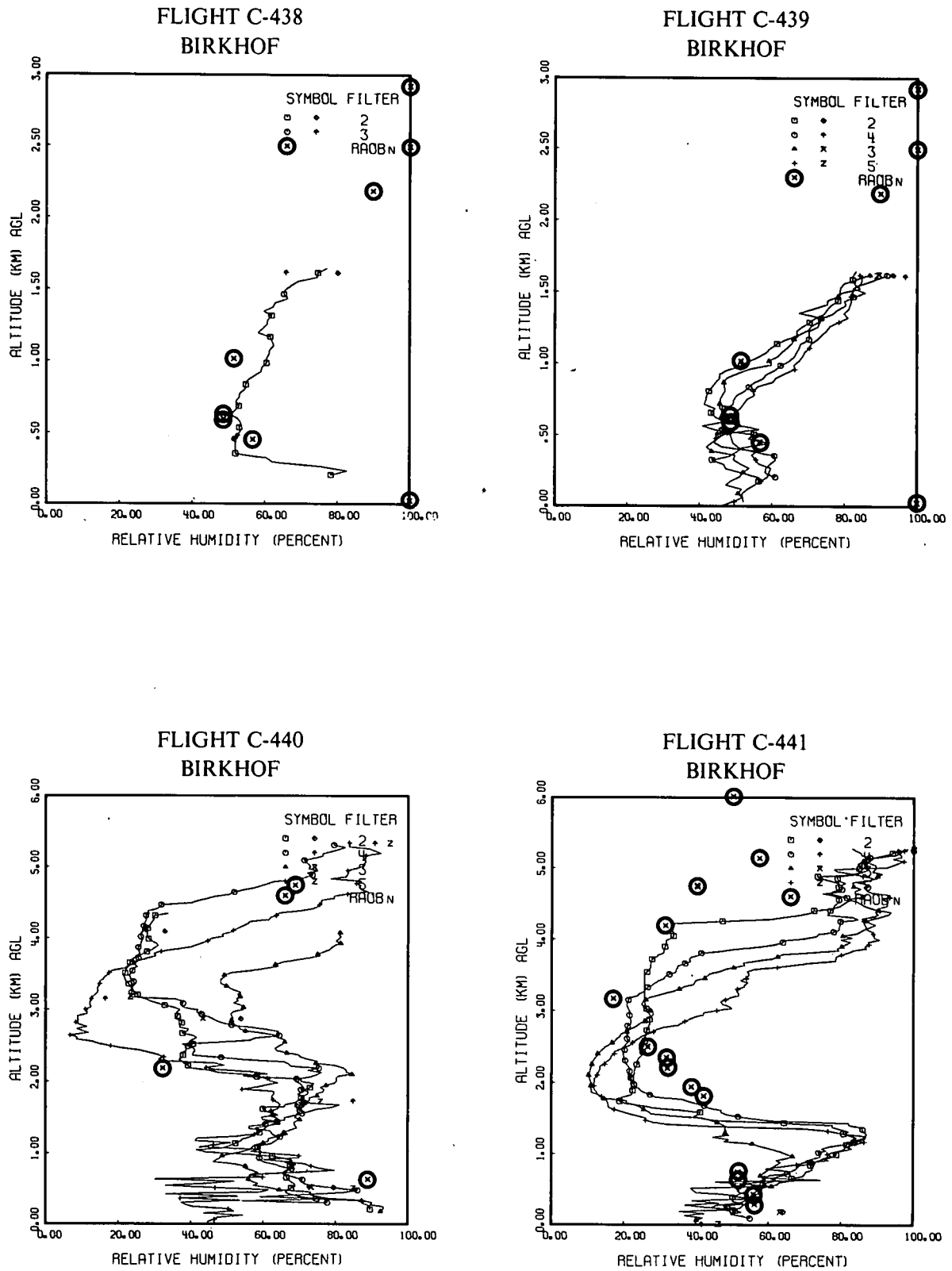
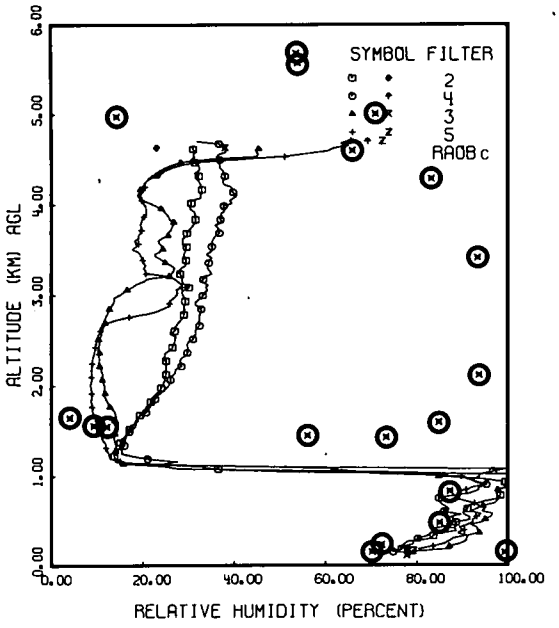
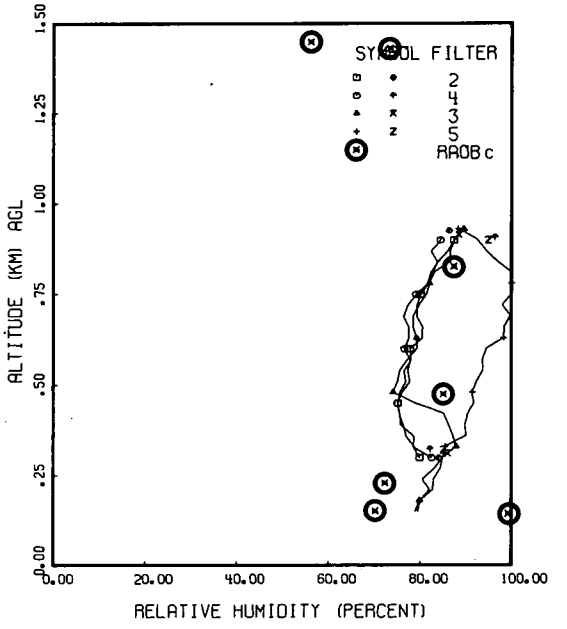


Fig. 6-3c. Relative Humidity Versus Altitude for 26 Project OPAQUE IV Flights.

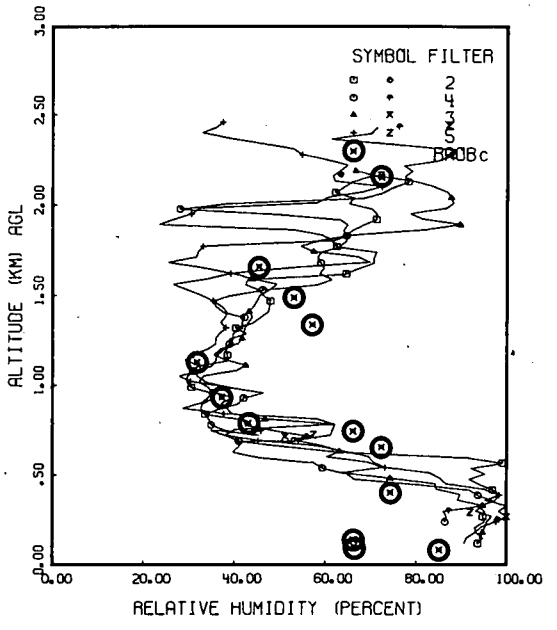
FLIGHT C-442
MILDENHALL



FLIGHT C-443
MILDENHALL



FLIGHT C-444
YEOVILTON



FLIGHT C-445
SOESTERBERG

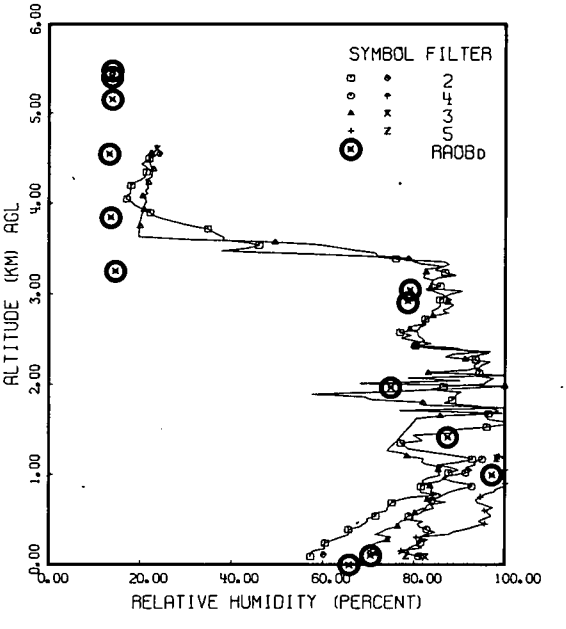
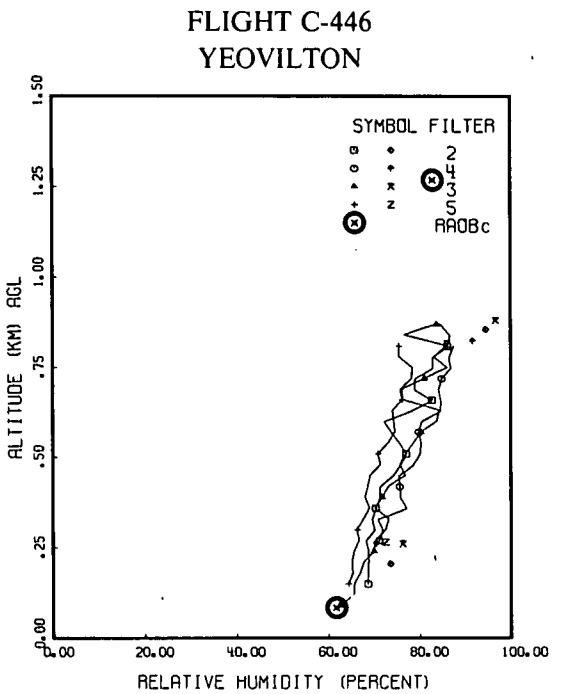
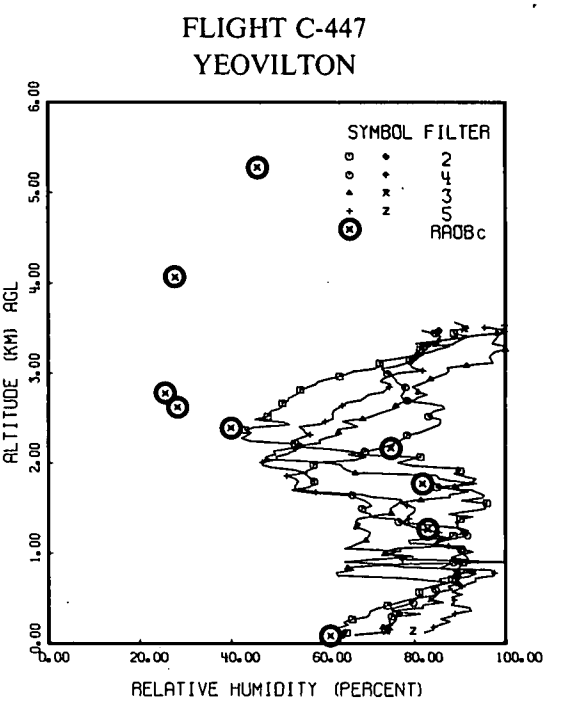
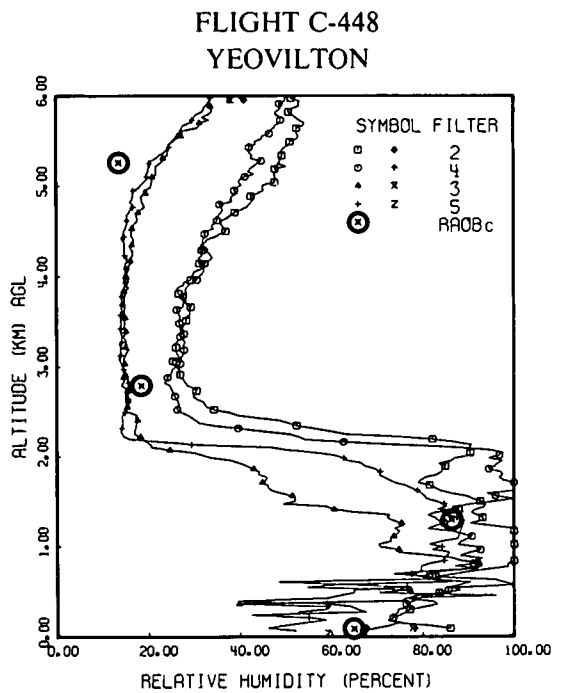


Fig. 6-3d. Relative Humidity Versus Altitude for 26 Project OPAQUE IV Flights.







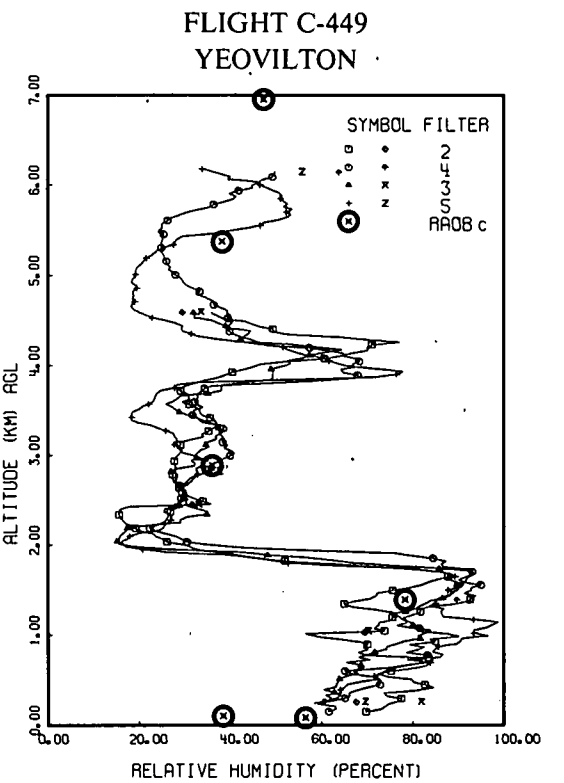


Fig. 6-3e. Relative Humidity Versus Altitude for 26 Project OPAQUE IV Flights.

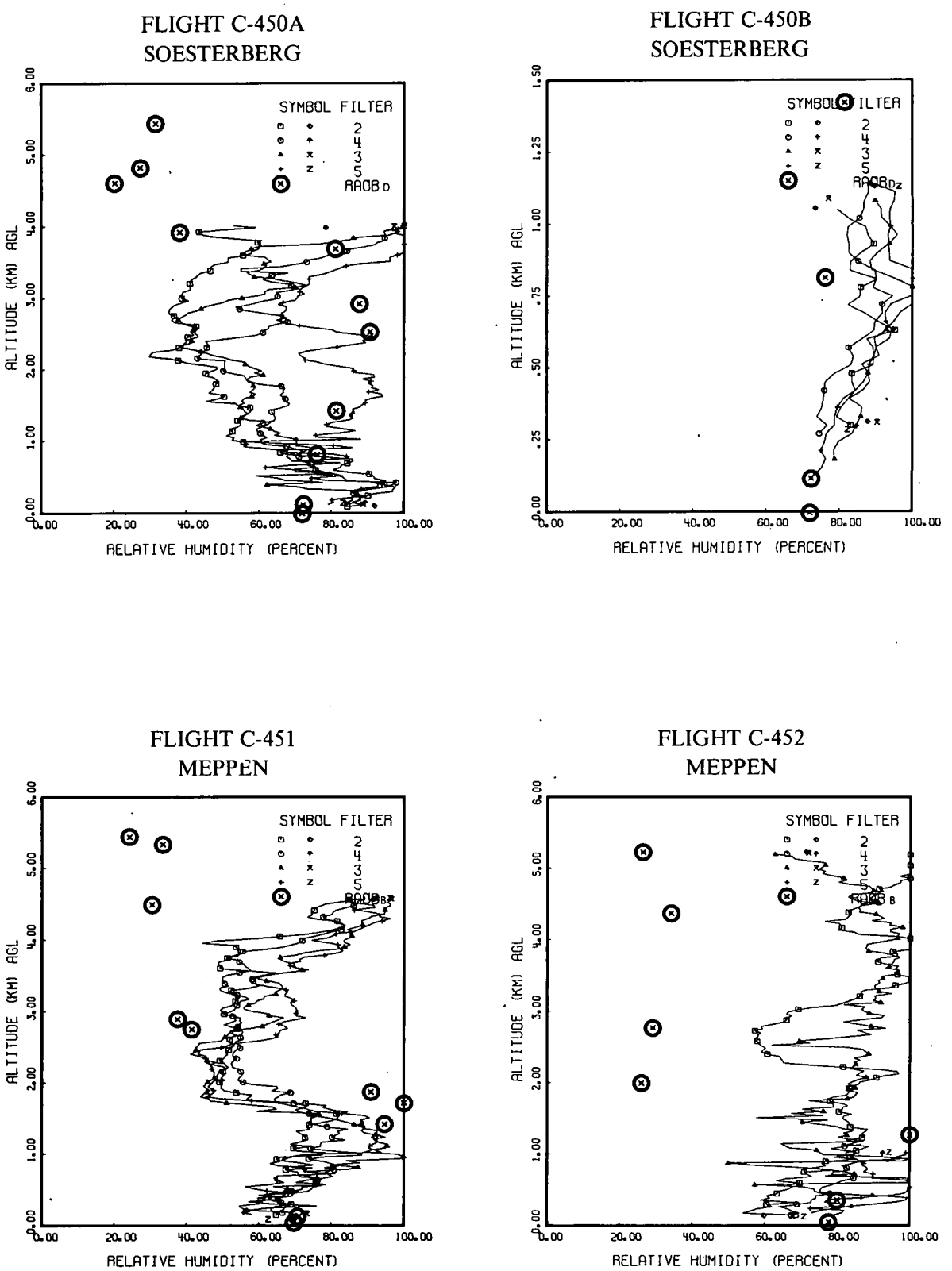


Fig. 6-3f. Relative Humidity Versus Altitude for 26 Project OPAQUE IV Flights.

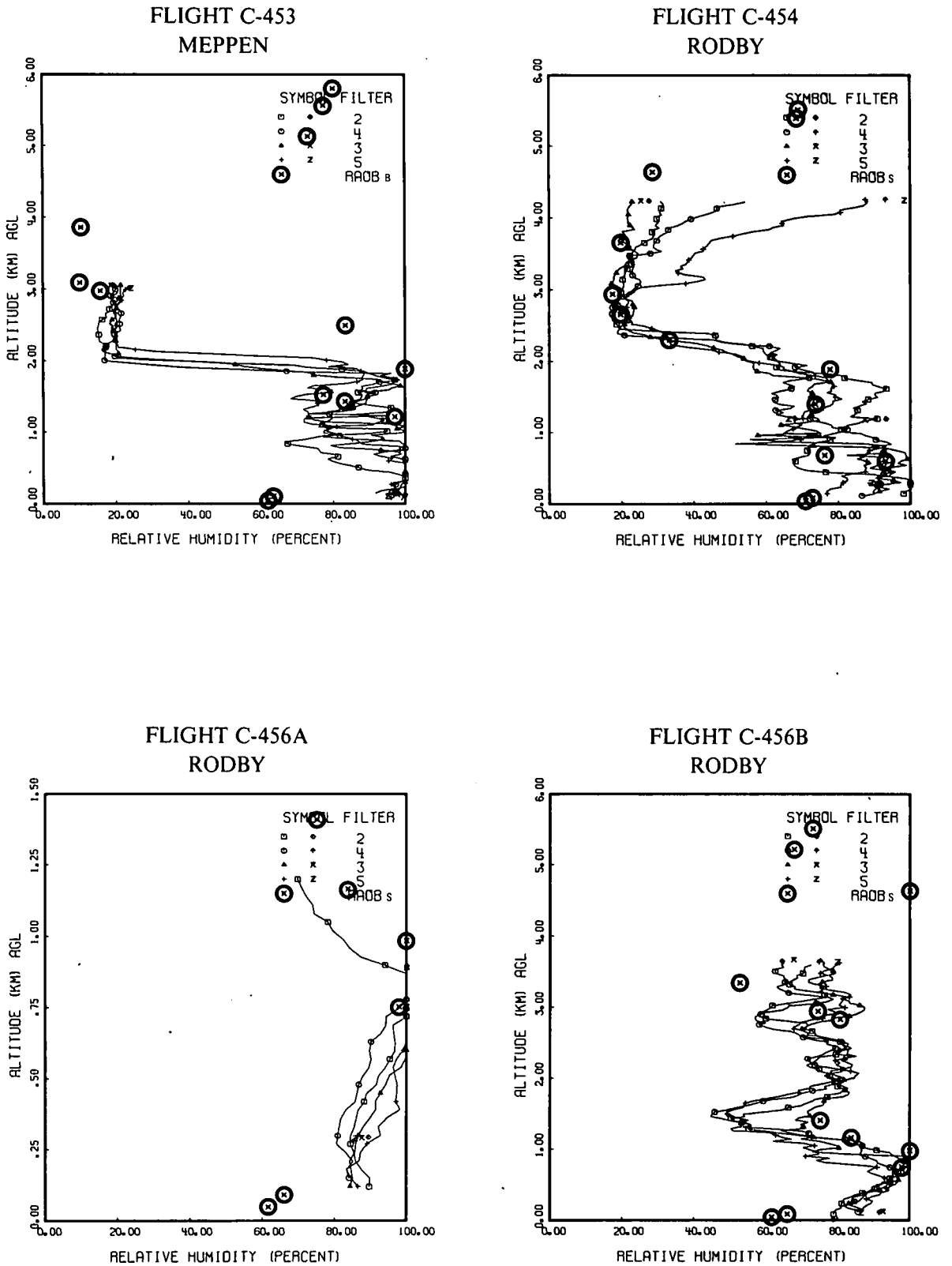


Fig. 6-3g. Relative Humidity Versus Altitude for 26 Project OPAQUE IV Flights.

During each of the flights an on-board meteorologist made and recorded observations concerning the cloud and haze conditions, shadows, visibility of the solar disc, and slant path visibilities from various altitudes. Some of these observations are included in the tables in the flight descriptions in Section 7.3. These in-flight observations have been very useful in evaluating and confirming the data recorded by the airborne instrument systems.

The daily flight descriptions which appear in Section 7.3 also include a discussion of the weather characteristics and a summary of the synoptic situation at the surface and 500-millibar levels during each flight. The synoptic conditions are detailed in Section 6.2 which also includes a description of conditions derived from satellite photographs and computer printouts of weather conditions and visibilities less than 5 nautical miles (9 km) over western Europe.

6.2. SYNOPTIC CONDITIONS

FLIGHT C-430 ON 31 JANUARY 1978

The 0000 GMT surface chart showed that a 1002 mb low was centered near Florencé, Italy and another 996 mb low was located near Oslo. There were no fronts associated with either of these lows. A stationary front was situated just west of the Irish coast. At 1200 GMT there was a low centered off Scotland with an occluded front southward to Edinburgh then a warm front southerly through Cardiff to near Madrid. A 1005 mb low was centered near Naples. Surface flow was west and northwest over the track which was located south of the low center. At 500 mb there was a low centered in the northern Adriatic with a cold trough through Sicily to Libya. The flow at 500 mb was northwesterly. The satellite photographs indicated thin scattered clouds over Sicily at 1311 GMT while most of the western European land mass was cloud covered. The computer printouts for 1200 and 1500 GMT indicated that most of northern Europe, from central France and Germany northward had precipitation with surface visibilities of 5 nautical miles (9 km) or less. The air mass was unstable maritime polar.

FLIGHT C-431 ON 1 FEBRUARY 1978

The 0000 GMT surface chart indicated that a deepening system in the western Atlantic had caused a weakening in the warm front that extended from the North Sea southward to Bordeaux. A filling low pressure area was centered near Brindisi, Italy. At 1200 GMT a deepening low with associated frontal systems was centered off Northern Ireland. The occluded front extended southeast to London, the warm front from London to Lyon, and the cold front from London westsouthwest into the Atlantic. There was another low centered in northern Greece. Sicily was in a col between these lows and a ridge from the Atlantic High over Algeria and Tunisia. At 500 mb a cold trough extended south-southwest from Denmark to Sicily and Libya. There was moderate northwesterly flow at this level. The satellite pictures for 1310 GMT showed thin clouds over Sicily while most of western Europe was covered with heavy clouds. The computer printouts showed that the surface visibilities were less than 5 nautical miles (9 km) over most of western Europe at 1200 GMT except for southern Italy and Sicily which showed no restrictions. There was also widespread precipitation over most of western Europe. The air mass was unstable maritime polar.

FLIGHT C-432 ON 3 FEBRUARY 1978

The 0000 GMT surface chart had a cold front extending from a low in the southern Adriatic westward north of Sicily through Bizerte and the southern Hispanic peninsula and connecting with another system in mid-Atlantic. At 1200 GMT there was a low in central Greece. The cold front had moved south and extended from southern Greece through central Tunisia and extreme southern Hispania then connected with a deepening system in mid-Atlantic. The flight track experienced the effects of post cold frontal conditions. At 500 mb there was a trough from Denmark through Italy and Sicily to Libya. A low was centered near Split, Yugoslavia. There was northwesterly flow over the track. Satellite coverage indicated that most of Europe was cloudy at 1300 GMT. The computer printouts for 1200 GMT showed rain in northeast and northwest Sicily as well as from central Germany northward. Surface visibility was 5 nautical miles (9 km) at Trapani and 3.8 nautical miles (7 km) in northeast Sicily at 1200 GMT. Most of Europe had visibilities less than 5 nautical miles (9 km) at 1200 and 1500 GMT. The air mass was unstable maritime polar.

FLIGHT C-433 ON 17 FEBRUARY 1978

The 0000 GMT surface chart had a warm front extending from Pisa to Messina, and a cold front from Pisa through central Sardinia to Cartegena. There were low clouds with rain over Sicily. At 1200 GMT there was a warm front from Naples southeastward into the Ionian Sea. There was a cold front from Naples southwest through the Tyrrhenian Sea then westward passing south of Sardinia. Sicily was situated between the fronts with the cold front approaching Trapani. Warm sector conditions prevailed over the alternate track. The chart also showed an intensive storm in mid-Atlantic. At 500 mb there was a weak trough from Corsica through Sardinia to Tunisia and Algeria. The flow was westerly over Sicily. The satellite photographs indicated that most of Europe was cloudy with a thin spot over Sicily at 1300 GMT. The computer printouts show visibility of 3.8 nautical miles (7 km) at Trapani at 0900 GMT. Visibility over the interior of Sicily was 0.0 nautical miles in rain and fog at 0900 and 1200 GMT. There was widespread precipitation over all of central Europe. The air mass was stable maritime polar.

FLIGHT C-434 ON 18 FEBRUARY 1978

The 0000 GMT surface chart showed an occluded front extending from the Adriatic southeast to the Ionian Islands, a warm front extended southeast to south of Greece. A cold front, part of the same system, extended from the Ionian Islands south and southwest to Libya. Another warm front, part of an extensive Atlantic storm, extended from northeast Spain into the Atlantic off the French coast. At 1200 GMT Sicily lay in a col. There was a warm front in the Pyrenees and a cold front off the coast of Portugal extended northward to southern Ireland. The track was in a col between two storm systems. The 500 mb chart showed ridging from Morocco to Spain to Britain combined with a trough from Poland to Greece. Sicily was between these systems and in a northwesterly flow. The satellite photographs showed that all of Europe was cloudy with thinner clouds over Sicily. The computer printouts showed poor visibility, less than 5 nautical miles (9 km), over most of Europe with rain and snow. The air mass was unstable maritime polar.

FLIGHTS C-435 AND C-436 ON 23 FEBRUARY 1978

At 0000 GMT the surface chart showed an occlusion south of Iceland extending southeast to the west coast of Ireland, then as a cold front off the coast of France through central Spain and then south-southwestward into the Atlantic. There was a 1026 mb high centered in Bulgaria. The 1200 GMT map showed an occlusion south of Iceland that extended east and southeast through Scotland, eastern Great Britain then southward through western France and eastern Spain into Africa and then westward to another storm in the eastern Atlantic. This chart had widespread fog in advance of the frontal system in Europe advected by southwesterly flow from the Mediterranean. The 500 mb chart showed ridging from Tunisia and eastern Algeria northward through western Germany to the North Sea. The flow remained southwesterly at this level. The satellite photographs indicated cloudiness over all of Europe with the exception of Italy and Sicily. The computer printouts showed precipitation in England and France at 0900 GMT spreading southeasterly by 1200 GMT into Holland and Belgium. Visibility less than 5 nautical miles (9 km) existed over England and Germany on both the 0900 and 1200 printouts except for a small area in West Germany near Switzerland. The air mass was stable maritime polar for both flights.

FLIGHT C-437 ON 27 FEBRUARY 1978

The surface chart for 0000 GMT had a cold front in eastern Austria, western Yugoslavia, southern Italy and southwest into Africa. Another cold front was approaching the Hispanic peninsula. At 1200 GMT there was an occluded front off the east coast of Spain with a dissipating warm front from the southern Balearics to Algeria. The cold front part of this system extended from the Balearics southwest through Morocco into the Atlantic. The surface flow was southerly with widespread fog and stratus in advance of the occlusion. At 500 mb there was a low in northeastern Yugoslavia with a minor trough from central West Germany to eastern Turkey. The flow at this level was southwesterly. The satellite photographs showed thin clouds over southern Germany at 1310 GMT. There were no computer printouts for this date. The air mass was modified stable maritime polar.

FLIGHT C-438 AND C-439 ON 1 MARCH 1978

The 0000 GMT surface chart had an occlusion which extended from southern Ireland through southwest England, western France and then as a cold front through eastern Spain then southwestward through Gibraltar into the Atlantic where it connected with another storm system. At 1200 GMT the occluded front extended from the Irish Sea to Belgium then as a cold front southward through eastern France into Algeria and then westward into the Atlantic to an advancing complex system. There was widespread fog in advance of the frontal system in Europe. At 500 mb there was slight ridging from Sicily to Belgium and southsouthwesterly flow. The satellite photographs indicated cloudy conditions over all of Europe except for Italy at 1310 GMT. The computer printouts showed widespread low visibility over Germany and eastward at 0900 GMT. There was rain over England and France at 1200 GMT. Birkhof track was in the best visibility area in Europe. The air mass was modified stable maritime polar.

FLIGHT C-440 ON 2 MARCH 1978

The surface chart for 0000 GMT had an occluded front west of Scotland that extended east-southeast to the North Sea then southward through central France. A cold front extended from central France into Algeria. At 1200 GMT an occluded front extended from a low in the English Channel through western France and central Spain and then southsouthwestward into the Atlantic. The southerly surface flow was advecting moisture from the Mediterranean into the area. At 500 mb there were lows centered south of Sicily and southeast of Iceland with troughing through Great Britain southeastward to Italy. The flow was southerly at this level also. The satellite photographs indicated the cold front over western France and showed that it was cloudy over most of Europe. The computer printouts showed low visibility over most of Europe, except for France and the southern part of Germany, with widespread rain and drizzle at both 0900 and 1200 GMT. The air mass was stable maritime polar.

FLIGHT C-441 ON 3 MARCH 1978

The surface chart for 0000 GMT had an occluded front through Rotterdam, Strasbourg, Marseille, Valencia, Cadiz and into the Atlantic. At 1200 GMT there was an occluded front from the North Sea into East Germany to Prague. A stationary front extended from Prague to Munich, Bern, the Balearics and southwest to Africa. The flight path was in a col west of the front and there was a weak gradient at the surface. At 500 mb there was slight ridging from northern Italy northwest to southern England. There were southsouthwesterly winds at this level. The satellite photographs indicate that clouds covered most of Europe. The computer printouts had precipitation over eastern Britain, Belgium, Holland, Denmark and Scandinavia, also Spain and southern France at 1200 GMT. Visibility was less than 5 nautical miles (9 km) over most of Europe except France and the track area. By 1500 GMT there was rain in Spain, France, Holland, Denmark, and Scandinavia reducing the visibilities to less than 5 nautical miles (9 km). The air mass was modified maritime polar.

FLIGHTS C-442 AND C-443 ON 9 MARCH 1978

The surface chart for 0000 GMT showed an occlusion that extended from north of the Arctic Circle southward through eastern Norway to Copenhagen, thence as a warm front from Copenhagen to central Yugoslavia. A cold front extended from Copenhagen to Schweinfurt, Lyon and La Rochelle, then as a wave westward into the Atlantic. There was a ridge of high pressure from the eastern Atlantic over Great Britain. At 1200 GMT a ridge of high pressure covered Britain and the North Sea and a 1030 mb high was centered near Paris. A warm front extended from Le Havre northwest through the Scilly Islands and western Ireland. There was southerly flow at the surface with pre-warm frontal low clouds over the track in southern England. At 500 mb there was ridging from Spain through Britain to Iceland. At this level the flow was northwesterly. The satellite photographs showed clouds over all of Great Britain. The computer printouts for 0900 GMT indicated low ceilings and visibilities less than 5 nautical miles (9 km) for all of Britain and northern France with fog and haze. By 1200 GMT there was precipitation in Ireland and northern Britain with visibilities less than 5 nautical miles (9 km) over all of Britain. At 1500 GMT rain was spreading down the west coast of Britain and into northern France. The air mass was stable maritime polar.

FLIGHT C-444 ON 11 MARCH 1978

The 0000 GMT surface chart showed a 978 mb low southwest of Iceland with an occlusion and then a cold front extending southward. The warm front part of this system extended eastward from 53.5N 15W across northern Ireland to Edinburgh then as a cold front northeastward into Scandinavia. There was a weakening ridge of high pressure over southern England. At 1200 GMT the low was centered near Reykjavik with an occlusion eastsoutheastward and a warm front southeast through the Orkney Islands into the North Sea, then as a cold front eastward into Russia. A cold front also extended from the occlusion southward through the Irish Sea and Scilly Islands into Portugal. The flight path was in the warm sector of the storm with southerly flow and stable conditions. At 500 mb there was ridging from northern Spain to the North Sea. The flow was southwesterly at this level. The satellite photographs indicated a cold front in the Irish Sea with heavy clouds over all of Great Britain. The computer printouts for 0900 GMT showed visibilities less than 5 nautical miles (9 km) throughout Great Britain with some drizzle. At 1200 GMT conditions were better in Scotland with drizzle on the west coast of England. By 1500 GMT drizzle was more widespread. The air mass was stable maritime polar.

FLIGHT C-445 ON 13 MARCH 1978

The surface chart for 0000 GMT had a low centered west of Bergen with a cold front extending through Denmark, central Germany and northern Italy into Morocco. A ridge from the Atlantic high was over the area from northwest Spain to Great Britain. At 1200 GMT a cold front extended from a low in northern Sweden through western Poland into central Italy and Algeria. The ridge over Britain was weakening as another strong frontal system approached the Irish coast. The flight track had post cold frontal unstable conditions. At 500 mb there was a trough from Norway southward through the Netherlands and France into Algeria. The flow at this level was westerly. The satellite photographs did not coincide with flight time. The computer printout for 0900 GMT showed rain in southeast England spreading to Belgium and Holland by 1200 GMT. There was also rain from Sweden through Germany to eastern France. The air mass was unstable maritime polar.

FLIGHTS C-446 AND C-447 ON 15 MARCH 1978

The surface chart for 0000 GMT showed that an occluded front extended from Aberdeen through the North Sea to central Germany, then as a cold front southsouthwest to the Balearics and Algeria. A warm front extended from central Germany southeast to the heel of the boot of Italy. There was another storm centered south of Iceland. At 1200 GMT the occluded front extended from south of Iceland to central Ireland then as a cold front southwest and west to another low in the western Atlantic. There was strong westsouthwesterly flow at the surface over southern England in advance of the occlusion. At 500 mb there was slight ridging from Spain through western France and England with westerly flow. There were no satellite photographs for this date. The computer printouts showed a few surface visibilities less than 5 nautical miles (9 km) in southern England. At 1200 GMT low clouds were present with some rain and drizzle in southeast England north of the track area. The air mass was stable maritime polar.

FLIGHT C-448 ON 17 MARCH 1978

The surface chart for 0000 GMT had a frontal system that extended from the Baltic Sea south-southwest to Sardinia then through Gibraltar to another storm in the mid-Atlantic. There was northerly surface flow over Britain with ridging from the Atlantic high as far north as Iceland. At 1200 GMT the ridging continued over Britain and north to Iceland from the Atlantic High centered at 37°N27°W. There was a low in central Finland with a frontal system that extended southsouthwest to Italy and Algeria. The 500 mb chart showed a ridge with its axis along 20°W. There was a trough from Sweden south to Germany. Over the flight track the flow was northwesterly. There were no satellite maps available for this date. The computer printout had low clouds with bases 1800 to 2000 feet over most of Britain with rain and snow showers. Visibility was usually greater than 5 nautical miles (9 km). Maritime polar air advected from the Atlantic was modified by passage over England before reaching the area of the flight track.

FLIGHT C-449 ON 18 MARCH 1978

The 0000 GMT surface chart had high pressure over western Europe with ridging from the Atlantic High. There was a frontal system in western Russia that extended southwest to southern Italy and into Tunisia. At 1200 GMT there was a low centered in northern Italy that had no associated frontal system. Ridging from the Atlantic High continued from Spain to Great Britain and western Germany. There was a cold front from eastern Romania southwest to Tunisia. Over the flight path the surface flow was westsouthwest from the North Atlantic. At 500 mb there was increasing ridging in the Irish Sea with a strong northnorthwesterly flow at this level. There were no satellite maps available for this date. The computer printouts were available for 1500 GMT only and indicated scattered to broken clouds at low levels over most of Europe with surface visibilities greater than 5 nautical miles (9 km). There were rain showers in Germany. The air mass was unstable maritime polar.

FLIGHTS C-450 AND C-451 ON 22 MARCH 1978

The 0000 GMT surface showed ridging from the Atlantic high extended northeast through France to western Germany was bringing maritime polar air into Netherlands. There was a low in the southern part of the Adriatic with a cold front extending southwest through the very foot of Italy into Libya. At 1200 GMT an occlusion extended southsoutheast from a low south of Iceland to Dundee, Cardiff, then as a warm front from Cardiff to Perigueux. The cold front part of this system extended from Cardiff to Brest and southwest into the Atlantic. Over both flight tracks there was southwesterly flow at the surface in the pre-warm frontal conditions. At 500 mb there was slight ridging from France to Norway and northwesterly flow at this altitude. The satellite photographs showed high clouds over the Netherlands and thin clouds over northern Europe. The computer printouts for 1200 GMT showed low clouds over Britain and the northern portion of Europe accompanied by showers of rain and snow by 1500 GMT. The air mass was stable maritime polar over both flight areas.

FLIGHT C-452 ON 23 MARCH 1978

The 0000 GMT surface chart showed an occlusion that extended from east of Iceland southeast

and south to near The Hague, then as a cold front through northwestern France and Spain into the Atlantic. At 1200 GMT an occlusion from a low in the North Sea was west of Norway and extended south and southwest through Kiel Bay to extreme western Czechoslovakia and northern Italy, then as a cold front with waves through central Spain into the Atlantic. The Meppen track had post cold frontal westerly winds and instability showers. The 500 mb chart showed ridging from Spain to southern Norway with southwesterly flow at this level. The satellite photographs showed a dissipating front in central Germany and Scandinavia. The computer printouts for 1200 and 1500 GMT had low clouds over Britain and eastern France into Poland. Visibilities were mostly more than 5 nautical miles (9 km) with showers and thundershowers over western Germany. The air mass was unstable maritime polar.

FLIGHTS C-453 AND C-454 ON 28 MARCH 1978

The surface chart for 0000 GMT had an occlusion that extended eastsoutheast from east of Iceland to southern Sweden, then as a cold front with waves through Hannover into the English Channel and southwest into the Atlantic. The warm front part of this system extended from southern Sweden southsoutheast through central Poland. At 1200 GMT the occlusion extended from Iceland to central Sweden then southeast to Latvia. A cold front extended westward from central Latvia through Poland to Berlin then as a wave through Hannover to Amsterdam and the Irish Sea, then as a cold front southsouthwest into the Atlantic. The flight track areas showed pre-warm frontal conditions with Rodby farther north of the warm front than Meppen. At 500 mb there was ridging from Algeria to Norway with westerly flow at this level. The satellite photographs showed clouds over northern Germany, Britain and Scandinavia. The computer printouts showed cloud ceilings of 3000 feet (0.9 km) for Germany and Denmark. The air mass was stable maritime polar over both tracks.

FLIGHTS C-456a AND C-456b ON 31 MARCH 1978

The surface chart for 0000 GMT had a low centered near Dessau with a cold front with a wave extending northeast into the Baltic and northwestern Russia. There was a cold front from the low center southward through Nürnberg, Milan, and Trapani. At 1200 GMT there was a weakening cold front along a line Helsinki, Kaliningrad, Vienna, Florence, Naples, Siracusa and Tripoli. There was a small 1013 mb high located near Alborg, Denmark. On the surface the anticyclonic circulation of the high brought moist air from the North Sea through the Kattegat to Femer Bay. At 500 mb there was a low west of Ireland and another in eastern Sardinia with a trough connecting them. At this level the flow was southwesterly. Satellite photographs were not available. The computer printouts for 1500 GMT showed low clouds at 1500 feet (0.5 km) with rain in northern Germany. The air mass was stable maritime polar.

6.3. TABULAR SUMMARY AND GLOSSARY

A summary of the daily meteorological observations taken at the weather stations nearest each flight track on the days during which data flights were made is presented in Table 6.3. A glossary of the most often used symbols is also included. All data were reported in Greenwich Civil Time (GCT) which is equivalent to Greenwich Mean Time (GMT), the terminology used in Table 6.3.

METEOROLOGICAL GLOSSARY AND ABBREVIATIONS

SKY AND CEILING

Sky cover symbols are in ascending order. Figures preceding symbols are heights in hundreds of feet above station. Sky cover symbols are:

- ○ Clear: less than 0.1 sky cover
- ⊙ Scattered: 0.1 to less than 0.6 sky cover
- ◍ Broken: 0.6 to 0.9 sky cover
- ⊕ Overcast: more than 0.9 sky cover
- \- Thin (when prefixed); light (when suffixed)
- -- Very light (when suffixed)
- -X Partial obscuration: 0.1 to less than 1.0 sky hidden by precipitation or obstruction to vision (bases at surface)
- X Obscuration: 1.0 sky hidden by precipitation or obstruction to vision (bases at surface)

Letter preceding height of layer identifies ceiling layer and indicates how ceiling height was obtained. Thus:

- A Aircraft
- B Balloon (pilot or ceiling)
- D Estimated height of cirriform clouds on basis of persistency
- E Estimated height of noncirriform clouds
- M Measured
- R Radiosonde balloon or radar
- U Height of cirriform ceiling layer unknown
- V Immediately following numerical value indicates a varying ceiling (also used with varying visibility)
- W Indefinite, sky obscured by surface base phenomenon, e.g. fog, blowing dust, snow

RELATIVE HUMIDITY (RH)

Reported in percent and computed from temperature and dewpoint.

VISIBILITY (VV)

Reported in kilometers.

WEATHER AND OBSTRUCTION TO VISION SYMBOLS

A	Hail	IF	Ice fog
AP	Small hail	K	Smoke
BD	Blowing dust	L	Drizzle
BN	Blowing sand	R	Rain
BS	Blowing snow	RW	Rain showers
D	Dust	S	Snow
E	Sleet	SG	Snow grains
EW	Sleet showers	SP	Snow pellets
F	Fog	SW	Snow showers
GF	Ground fog	T	Thunderstorms
H	Haze	ZL	Freezing drizzle
IC	Ice crystals	ZR	Freezing rain

CLOUD ABBREVIATIONS

Ac	Altocumulus	Cs	Cirrostratus
As	Altostratus	Cu	Cumulus
Cb	Cumulonimbus	Ns	Nimbostratus
Cc	Cirrocumulus	Sc	Stratocumulus
Ci	Cirrus	St	Stratus

WIND

Direction in ten's of degrees from true north, speed in meters per second (mps). A "0000" indicates calm. A "G" indicates gusty. A "Q" indicates squall. Peak speed of gusts, when reported, follows G or Q. The contraction WSHFT in remarks followed by time group (GMT) indicates wind shift and its time of occurrence.

Examples: 0109 is 010 degrees, 9 mps.
3607G11 is 360 degrees, 7 mps, peak speed in gusts of 11 mps.

Table 6.3. Standard Meteorological Data Sheet

Time GMT	Sky and Ceiling (Hundreds of Feet)	Visibility (Kilometers)	Weather and Obstructions To Vision	Temp. (°C)	Dewpoint (°C)	Wind Direction (00-36)	Wind Speed (mps)	Remarks
Flight No. C-430								Field Site: Trapani
Date: 31 January 1978								Lat. 37°33'N Long. 12°30'E El. Sea Level
TRAPANI (164290) 37°55'N 12°31'E		Elev. 7m	40.8 Km NE of Track Center					
1300	25⊙ 80-⊕	11.2		12.2	5.2	27	8.2	4/8 Cu 5/8 As
1320	25⊙ E80⊕	9.0	TRW			33	9.7	3/8 Cb 8/8 As
1400	25⊙	11.2		10.2	6.2	33	9.2	3/8 Cu
1500	25⊙	11.2		11.2	5.2	28	5.6	3/8 Cu
1600	25⊙	11.2		11.2	6.2	28	8.2	2/8 Cu
1700	25⊙	11.2		11.2	5.2	33	8.2	3/8 Cu
PANTELLERIA (164700) 36°49'N 11°59'E		Elev. 187m	93.5 Km SW of Track Center					
1300	20⊙	11.2		10.2	6.2	25	14.9+	Gusts 22.1 3/8 Cu
1400	20⊙ E80⊕	11.2		9.2	3.2	24	11.8+	Gusts 19.5 2/8 Cu 5/8 As
1500	25⊙ E80⊕	11.2	R-	7.2	4.2	30	8.2	3/8 Cb 6/8 As
1600	25⊙	11.2	R-	6.2	4.2	26	10.2	3/8 Cb
1700	25⊙	11.2	R-	9.2	6.2	28	8.2	3/8 Cb
Flight No. C-431								Field Site: Trapani
Date: 1 February 1978								Lat. 37°33'N Long. 12°30'E El. Sea Level
TRAPANI (164290) 37°55'N 12°31'E		Elev. 7m	40.8 Km NE of Track Center					
0900	15⊙ 200-⊕	11.2		9.2	4.2	36	1.0	4/8 Cb 5/8 Ci
1000	15⊙ 200-⊙	11.2		12.2	4.2	32	4.6	3/8 Cu 4/8 Ci
1100	15⊙ 200-⊙	11.2		13.2	4.2	32	3.6	3/8 Cu 4/8 Ci
1200	15⊙ 90⊙ 200-⊕	11.2		13.2	4.2	32	3.6	3/8 Cu 4/8 As 6/8 Ci
1300	15⊙ E90⊕	11.2		13.2	5.2	24	3.0	3/8 Cu 6/8 As
1400	15⊙ E90⊕	11.2		12.2	5.2	28	3.0	3/8 Cu 7/8 As
1500	15⊙ E90⊕	11.2		12.2	5.2	27	2.5	3/8 Cu 8/8 As
PANTELLERIA (164700) 36°49'N 11°59'E		Elev. 187m	93.5 Km SW of Track Center					
0900	15⊙ 200-⊕	11.2		10.2	5.2	31	3.6	3/8 Cu 5/8 Ci
1000	15⊙ 200-⊕	11.2		11.2	5.2	29	4.1	3/8 Cu 5/8 Ci
1100	15⊙ 90⊙ 200-⊕	11.2		11.2	5.2	27	5.1	3/8 Cu 4/8 As 6/8 Ci
1200	15⊙ E90⊕	20.0		12.2	8.2	26	6.2	3/8 Cu 7/8 As
1300	13⊙ E90⊕	11.2		10.2	8.2	25	6.6	3/8 Cu 7/8 As
1400	E11⊕ 90⊕	11.2	R-	9.2	7.2	25	8.7	6/8 Cu 8/8 As
1500	11⊙ E90⊕	11.2		9.2	7.2	25	8.7	4/8 Cu 8/8 As
Flight No. C-432								Field Site: Trapani
Date: 3 February 1978								Lat. 37°33'N Long. 12°30'E El. Sea Level
TRAPANI (164290) 37°55'N 12°31'E		Elev. 7m	40.8 Km NE of Track Center					
1100	15⊙ E80⊕	11.2		12.2	6.2	30	4.6	2/8 Cu & Sc 8/8 As
1200	15⊙ E80⊕	9.0	R-	10.2	6.2	33	5.1	1/8 Cu & Sc 8/8 As
1300	15⊙ E80⊕	7.0	R-	10.2	7.2	35	3.6	1/8 Cu & Sc 8/8 As
1500	15⊙ E80⊕	11.2		10.2	8.2	35	3.0	1/8 Cu & Sc 8/8 As
PANTELLERIA (164700) 36°49'N 11°59'E		Elev. 187m	93.5 Km SW of Track Center					
1100	15⊙. 100⊙ E200⊕	11.2		12.2	7.2	28	12.8+	Gusts 20.0 2/8 Cu 3/8 Ac 6/8 Ci
1200	15⊙ 200⊙	11.2		12.2	7.2	29	11.3+	Gusts 18.0 2/8 Cu 4/8 Ci
1300	20⊙ 200⊙	11.2		12.2	6.2	28	10.2+	Gusts 15.4 3/8 Cu 4/8 Ci
1500	E21⊕	11.2		12.2	5.2	28	9.7+	Gusts 15.4 5/8 Cu
Flight No. C-433								Field Site: Sigonella
Date: 17 February 1978								Lat. 37°24'N Long. 15°20'E El. Sea Level
TRAPANI (164290) 37°55'N 12°31'E		Elev. 7m	254 Km WNW of Track Center					
1000	15⊙ E80⊕	7.0	F-	15.2	13.2	00	00	2/8 Cu 7/8 Ac
1100	15⊙ E80⊕	7.0	F-	15.2	13.2	26	3.6	3/8 Cu 7/8 Ac
1200	15⊙ E80⊕	7.0	F-	15.2	13.2	26	2.5	4/8 Cu 8/8 Ac
1300	15⊙ E80⊕	7.0	F-	15.2	13.2	-	-	4/8 Cu 8/8 Ac
PANTELLERIA (164700) 36°49'N 11°59'E		Elev. 187m	304 Km WSW of Track Center					
1000	20⊙ E80⊕	11.2		15.2	11.2	25	6.6	2/8 Cu 5/8 Ac
1100	20⊙ 80⊙	11.2		14.2	11.2	25	8.7	2/8 Cu 4/8 Ac
1200	E20⊕	11.2		15.2	12.2	26	6.6	8/8 Cb
1300	E8 ⊕	7.0	F-	14.2	11.2	27	7.7	5/8 Fs
SIGONELLA (164590) 37°24'N 14°55'E		Elev. 22m	000 Km W of Track Center					
1200		11.2		18.2	11.2	27	4.1	3/8 Low Cloud
1300		10.2		19.2	10.2	27	5.1	2/8 Low Cloud

Ceilings were greater than 70,000 feet. Cloud heights and types were undefined.

Table 6.3. (Cont.) Standard Meteorological Data Sheet

Time GMT	Sky and Ceiling (Hundreds of Feet)	Visibility (Kilometers)	Weather and Obstructions To Vision	Temp. (°C)	Dewpoint (°C)	Wind Direction (00-36)	Wind Speed (mps)	Remarks
Flight No. C-434								Field Site: Sigonella
Date: 18 February 1978								Lat. 37°24'N Long. 15°20'E El. Sea Level
TRAPANI (164290) 37°55'N 12°31'E		Elev. 7m	254 Km WNW of Track Center					
0900	E12Ⓓ 200Ⓓ	9.0	F-	15.2	13.2	27	2.5	5/8 Cu 6/8 Ci
1000	15Ⓓ E200Ⓓ	9.0	F-	16.2	13.2	22	2.0	2/8 Cu 6/8 Ci
1100	15Ⓓ 200-Ⓓ	9.0	F-	16.2	14.2	25	4.6	2/8 Cu 6/8 Ci
1200	15Ⓓ E190Ⓓ	9.0	F-	16.2	13.2	24	5.1	1/8 Cu 7/8 Ci
1300	15Ⓓ 190-Ⓓ	11.2		17.2	13.2	24	4.6	1/8 Cu 6/8 Ci
1400	15Ⓓ 200-Ⓓ	11.2		17.2	14.2	26	5.6	2/8 Cu 3/8 Ci
1500	15Ⓓ	11.2		16.2	14.2	26	5.6	2/8 Cu
1600	15Ⓓ	11.2		16.2	14.2	26	2.0	1/8 Cu
PANTELLERIA (164700) 36°49'N 11°59'E		Elev. 187m	304 Km WSW of Track Center					
0900	E5Ⓓ 200Ⓓ	5.0	F-	13.2	10.2	25	7.7	5/8 Fs 7/8 Ci
1000	E5Ⓓ 200Ⓓ	5.0	F-	13.2	11.2	23	6.1	5/8 Fs 7/8 Ci
1100	15Ⓓ 200Ⓓ	6.0	F-	14.2	11.2	26	6.1	2/8 Cu 4/8 Ci
1200	15Ⓓ 200Ⓓ	7.0	F-	15.2	11.2	26	6.1	1/8 Cu 3/8 Ci
1300	200-Ⓓ	-		-	-	27	6.6	2/8 Ci
1400	200-Ⓓ	-		-	-	26	6.6	2/8 Ci
1500	200-Ⓓ	-		15.2	10.2	25	6.6	2/8 Ci
1600	200-Ⓓ	-		-	-	25	6.6	2/8 Ci
SIGONELLA (164590) 37°24'N 14°53'E		Elev. 22m	000 Km W of Track Center					
1400		11.2		19.2	6.2	32	3.0	2/8 Low Cloud
1500		11.2		19.2	6.2	31	2.5	2/8 Low Cloud
1600		11.2		18.2	6.2	28	1.5	2/8 Low Cloud
Ceilings were greater than 70,000 feet. Cloud heights and types were undefined.								
Flight No. C-435								Field Site: Birkhof
Date: 23 February 1978								Lat. 48°15'N Long. 9°05'E El. 762m
FREUDENSTAD (108150) 48°27'N 8°26'E		Elev. 797m	52.9 Km W of Track Center					
0700	E23Ⓓ 100⊕	28.0		6.2	-3.8	17	2.5	7/8 Cu 8/8 Ac
0800	E24Ⓓ 100⊕	30.0		7.2	-4.8	17	2.0	5/8 Cu 8/8 Ac
0900	24Ⓓ E100Ⓓ	30.0		6.2	-2.8	20	1.0	2/8 Cu 7/8 Ac
1000	24Ⓓ E100Ⓓ	40.0		9.2	-5.8	25	2.5	4/8 Cu 7/8 Ac
1100	E26Ⓓ 100Ⓓ	40.0		12.2	-4.8	25	2.0	6/8 Cu 7/8 Ac
SPAICHINGER (108180) 48°6'N 8°47'E		Elev. 973m	27.8 Km SW of Track Center					
0700	35Ⓓ E120⊕	60.0		6.2	-2.8	17	4.6	1/8 Cu 8/8 Ac
0800	35Ⓓ E110⊕	70.0		6.2	-2.8	19	3.6	1/8 Cu 8/8 Ac
0900	35Ⓓ E90Ⓓ 200Ⓓ	70.0		7.2	-2.8	15	4.1	1/8 Cu 5/8 Ac 7/8 Ci
1000	35Ⓓ E120Ⓓ 200Ⓓ	75.0		7.2	-1.8	16	5.1	1/8 Cu 5/8 Ac 7/8 Ci
1200	35Ⓓ E110Ⓓ 200Ⓓ	75.0		8.2	-2.8	14	4.6	3/8 Cu 6/8 Ac 7/8 Cs
ULM (108380) 48°23'N 9°59'E		Elev. 522m	68.2 Km ENE of Track Center					
0700	W0⊗	0.0	F	-0.8	-0.8	26	1.0	SKY OBSCURED
0800	W0⊗	0.0	F	-0.8	-0.8	00	0.0	SKY OBSCURED
0900	W0⊗	0.0	F	0.2	-0.8	00	0.0	SKY OBSCURED
1000	W0⊗	0.0	F	0.2	0.2	21	1.0	SKY OBSCURED
1100	E7 Ⓓ	1.0	F	2.2	1.2	21	1.0	7/8 St
Flight No. C-436								Field Site: Birkhof
Date: 23 February 1978								Lat. 48°15'N Long. 9°05'E El. 762m
FREUDENSTAD (108150) 48°27'N 8°26'E		Elev. 797m	52.9 Km W of Track Center					
1200	26Ⓓ E90⊕	45.0		12.2	-3.8	26	1.0	2/8 Sc 8/8 Ac
1300	25Ⓓ 90Ⓓ E240Ⓓ	45.0		9.2	2.2	15	1.5	3/8 Sc 4/8 Ac 7/8 Ci
1400	35Ⓓ E90⊕	45.0		10.2	-2.8	14	0.5	3/8 Sc 8/8 Ac
1600	E40Ⓓ 90⊕	40.0		7.2	3.2	00	0.0	5/8 Sc 8/8 Ac
SPAICHINGER (108180) 48°6'N 8°47'E		Elev. 973m	27.8 Km SW of Track Center					
1200	35Ⓓ E110Ⓓ 200Ⓓ	75.0		8.2	-2.8	14	4.6	3/8 Cu 6/8 Ac 7/8 Cs
1300	35Ⓓ E100Ⓓ 200⊕	60.0		11.2	-1.8	14	2.5	4/8 Cu 7/8 Ac 8/8 Cs
1400	35Ⓓ E100⊕	60.0		10.2	-2.8	19	3.0	3/8 Cu 8/8 Ac
1500	35Ⓓ E100⊕	60.0		10.2	-1.8	20	3.1	1/8 Cu 8/8 Ac
1600	35Ⓓ E80⊕	60.0		9.2	-2.8	15	3.6	2/8 Cu 8/8 Ac
ULM (108380) 48°23'N 9°59'E		Elev. 522m	68.2 Km ENE of Track Center					
1200	E15⊕	2.0	F-	4.2	1.2	14	1.0	8/8 Sc
1300	15Ⓓ E230⊕	4.5	H	3.2	0.2	21	3.6	2/8 Sc 8/8 Ci
1400	E40Ⓓ 90⊕	4.8	H	4.2	1.2	19	0.5	5/8 Sc 8/8 As
1500	40Ⓓ E90⊕	5.0	H	4.2	1.2	15	2.6	4/8 Sc 8/8 As
1600	40Ⓓ E90Ⓓ	5.0	H	4.2	1.2	36	1.0	3/8 Sc 7/8 As

Table 6.3. (Cont.) Standard Meteorological Data Sheet

Time GMT	Sky and Ceiling (Hundreds of Feet)	Visibility (Kilometers)	Weather and Obstructions To Vision	Temp. (°C)	Dewpoint (°C)	Wind Direction (00-36)	Wind Speed (mps)	Remarks
Flight No. C-437								Field Site: Birkhof
Date: 27 February 1978								Lat. 48°15'N Long. 9°05'E El. 762m
FREUDENSTAD (108150) 48°27'N 8°26'E Elev. 797m 52.9 Km W of Track Center								
0900	E230◐	30.0		4.2	2.2	00	0.0	5/8 Ci
1000	E220◐	40.0		4.2	2.2	13	1.0	6/8 Ci
1100	E220◐	40.0		7.2	3.2	15	1.0	6/8 Ci
1200	20◑ E220◐	40.0		8.2	4.2	15	1.5	1/8 Cu 6/8 Ci
1300	20◑ E220◐	40.0		8.2	4.2	09	1.0	1/8 Cu 6/8 Ci
1400	20◑ E210◐	50.0		7.2	2.2	11	0.5	1/8 Cu 6/8 Ci
SPAICHINGER (108180) 48°6'N 8°47'E Elev. 973m 27.8 Km SW of Track Center								
0900	E230◐	75.0		5.2	1.2	17	4.1	6/8 Ci
1000	E230◐	75.0		6.2	1.2	15	3.6	6/8 Ci
1100	E230◐	75.0		6.2	1.2	15	3.0	7/8 Ci
1200	E230◐	70.0		8.2	1.2	15	2.1	7/8 Ci
1300	20◑ E230◐	75.0		7.2	1.2	15	4.6	1/8 Sc 7/8 Ci
1400	20◑ E230◐	75.0		6.2	2.2	11	5.1	2/8 Sc 7/8 Ci
ULM (108380) 48°23'N 9°59'E Elev. 522m 68.2 Km ENE of Track Center								
0900	W1⊗	0.2	F	3.2	3.2	25	1.0	SKY OBSCURED
1000	230◑	0.5	F	3.2	3.2	21	1.5	1/8 Ci
1100	230◑	0.8	F	5.2	4.2	18	1.0	2/8 Ci
1200	230◑	9.0		5.2	4.2	09	1.0	4/8 Ci
1300	E230◐	12.0		8.2	4.2	09	1.0	5/8 Ci
1400	E230◐	15.0		7.2	4.2	09	2.0	6/8 Ci
Flight No. C-438								Field Site: Birkhof
Date: 1 March 1978								Lat. 48°15'N Long. 9°05'E El. 762m
FREUDENSTAD (108150) 48°27'N 8°26'E Elev. 797m 52.9 Km W of Track Center								
0800	E70◐	65.0		6.2	-0.8	19	1.5	5/8 Ac
0900	E70◐ 200◐	65.0		8.2	-1.8	16	1.5	5/8 Ac 6/8 Ci
1000	E70◐ 200◐	65.0		8.2	-2.8	18	1.5	5/8 Ac 6/8 Ci
SPAICHINGER (108180) 48°6'N 8°47'E Elev. 973m 27.8 Km SW of Track Center								
0800	80◑ 230-◐	75.0		5.2	0.2	12	5.6	2/8 Ac 5/8 Ci
0900	80◑ E230◐	75.0		6.2	1.2	12	4.6	2/8 Ac 6/8 Ci
1000	80◑ E230◐	75.0		8.2	-0.8	13	4.1	2/8 Ac 7/8 Ci
1100	80◑ E230◐	75.0		8.2	0.2	12	8.2	3/8 Ac 7/8 Ci
ULM (108380) 48°23'N 9°59'E Elev. 522m 68.2 Km ENE of Track Center								
0800	W0⊗	0.0	F	0.2	0.2	36	2.5	SKY OBSCURED
0900	W0⊗	0.0	F	0.2	0.2	30	2.1	SKY OBSCURED
1000	W0⊗	0.0	F	0.2	0.2	04	1.5	SKY OBSCURED
1100	W1⊗	0.3	F	1.2	1.2	00	0.0	SKY OBSCURED
Flight No. C-439								Field Site: Birkhof
Date: 1 March 1978								Lat. 48°15'N Long. 9°05'E El. 762m
FREUDENSTAD (108150) 48°27'N 8°26'E Elev. 797m 52.9 Km W of Track Center								
1200	E60◐	65.0		10.2	-2.8	18	1.5	7/8 Ac
1300	E60◐	65.0		11.2	-2.8	16	2.5	5/8 Ac
1400	50◑ E60◐	60.0		11.2	-4.8	15	1.5	1/8 Sc 6/8 Ac
1500	50◑ 60◑ 200-◐	50.0		11.2	-3.8	20	1.5	3/8 Sc 4/8 Ac 6/8 Ci
SPAICHINGER (108180) 48°6'N 8°47'E Elev. 973m 27.8 Km SW of Track Center								
1200	120◑ E230◐	75.0		8.2	-1.8	12	4.6	4/8 Ac 7/8 Cs
1300	50◑ E120◐ 230◐	70.0		8.2	1.2	13	3.8	1/8 Sc 6/8 Ac 7/8 Cs
1400	50◑ E110◐ 230◐	60.0		8.2	1.2	13	2.0	1/8 Sc 6/8 Ac 7/8 Cs
1500	50◑ E90◐ 230◐	75.0		8.2	0.2	14	2.1	3/8 Sc 6/8 Ac 7/8 Cs
ULM (108380) 48°23'N 9°59'E Elev. 522m 68.2 Km ENE of Track Center								
1300	W3⊗	0.8	F	2.2	1.2	09	1.5	SKY OBSCURED
1400	3◑ 100◑ E240◐	1.8	F-	3.2	2.2	10	1.5	2/8 St 4/8 Ac 7/8 Ci
1500	5◑ 100◑ E240◐	1.8	F-	2.2	1.2	08	1.5	1/8 St 4/8 Ac 7/8 Ci

Table 6.3. (Cont.) Standard Meteorological Data Sheet

Time GMT	Sky and Ceiling (Hundreds of Feet)	Visibility (Kilometers)	Weather and Obstructions To Vision	Temp. (°C)	Dewpoint (°C)	Wind Direction (00-36)	Wind Speed (mps)	Remarks
Flight No. C-440								Field Site: Birkhof
Date: 2 March 1978								Lat. 48°15'N Long. 9°05'E El. 762m
FREUDENSTAD (108150) 48°27'N 8°26'E		Elev. 797m 52.9 Km W of Track Center						
1000	15⊙ E230⊙	35.0		5.2	0.2	13	1.5	2/8 Cu 5/8 Ci
1100	15⊙ E230⊙	40.0		6.2	-0.8	12	2.0	1/8 Cu 5/8 Ci
1200	15⊙ E230⊙	50.0		8.2	0.2	13	1.0	1/8 Cu 5/8 Ci
1300	15⊙ 100⊙ E230⊙	50.0		8.2	-2.8	14	1.5	1/8 Sc 3/8 Ac 7/8 Cs
1400	20⊙ 100⊙ 230-⊙	50.0		7.2	-0.8	09	1.5	2/8 Sc 3/8 Ac 7/8 Cs
1500	20⊙ 100⊙ E230⊙	40.0		8.2	-0.8	15	2.1	2/8 Sc 3/8 Ac 7/8 Cs
SPAICHINGER (108180) 48°6'N 8°47'E		Elev. 973m 27.8 Km SW of Track Center						
1000	100⊙ E230⊙	50.0		4.2	2.2	11	3.0	1/8 Ac 7/8 Ci
1100	100⊙ E230⊙	60.0		5.2	1.2	12	5.1	1/8 Ac 6/8 Ci
1200	100⊙ E230⊙	50.0		5.2	1.2	12	3.6	1/8 Ac 5/8 Ci
1300	E100⊙ 220⊙	60.0		5.2	1.2	11	4.1	5/8 As 7/8 Cs
1400	E100⊙ 200⊕	60.0		5.2	1.2	11	4.6	5/8 As 8/8 Cs
1500	100⊙ E200⊕	50.0		6.2	1.2	12	3.6	2/8 As 8/8 Cs
ULM (108380) 48°23'N 9°59'E		Elev. 522m 68.2 Km ENE of Track Center						
1000	W2 ⊗	0.3	F	2.2	2.2	00	0.0	SKY OBSCURED
1100	E40⊙ 250⊙	3.2	F-	5.2	3.2	10	1.0	5/8 Sc 6/8 Ci
1200	40⊙ F250⊙	6.0	F-	6.2	3.2	06	1.5	1/8 Sc 5/8 Ci
1300	40⊙ 250⊙	10.0		8.2	4.2	06	2.5	1/8 Sc 4/8 Ci
1400	40⊙ 90⊙ 250⊙	12.0		8.2	4.2	05	2.5	1/8 Sc 3/8 Ac 4/8 Ci
1500	40⊙ E90⊕	12.0		7.2	3.2	12	2.1	2/8 Sc 8/8 Ac
Flight No. C-441								Field Site: Birkhof
Date: 3 March 1978								Lat. 48°15'N Long. 9°05'E El. 762m
FREUDENSTAD (108150) 48°27'N 8°26'E		Elev. 797m 52.9 Km W of Track Center						
1400	25⊙ 200⊙	75.0		12.2	-6.8	15	1.5	1/8 Cu 2/8 Ci
1500	25⊙ 200⊙	75.0		12.2	-5.8	00	0.0	1/8 Cu 4/8 Ci
1600	100⊙ 220⊙	70.0		10.2	-3.8	09	0.5	1/8 Ac 3/8 Ci
1700	100⊙ E230⊙	70.0		8.2	-3.8	00	0.0	1/8 Ac 5/8 Ci
SPAICHINGER (108180) 48°6'N 8°47'E		Elev. 973m 27.8 Km SW of Track Center						
1400	25⊙ 220⊙	75.0		11.2	-0.8	31	1.5	1/8 Sc 3/8 Ci
1500	25⊙ 230⊙	70.0		10.2	-0.8	08	1.5	1/8 Sc 3/8 Ci
1600	25⊙ 230⊙	70.0		9.2	-0.8	10	2.5	1/8 Sc 4/8 Ci
1700	E230⊙	60.0		7.2	-0.8	11	4.1	5/8 Ci
ULM (108380) 48°23'N 9°59'E		Elev. 522m 68.2 Km ENE of Track Center						
1400	200⊙	15.0		11.2	4.2	11	1.0	2/8 Ci
1500	200⊙	15.0		12.2	1.2	07	1.5	3/8 Ci
1600	200⊙	15.0		11.2	3.2	07	2.0	3/8 Ci
1700	200⊙	15.0		10.2	3.2	07	1.5	4/8 Ci
Flight No. C-442								Field Site: Mildenhall
Date: 9 March 1978								Lat. 52°24'N Long. 1°41'E El. Sea Level
BOSCOMBE DOWN (037460) 51°10'N 1°45'W		Elev. 124m 273 Km SW of Track Center						
1000	E3⊙	6.0	H	7.2	6.2	17	3.6	7/8 St
1100	3⊙ E40⊙	4.0	H	8.2	7.2	18	3.6	1/8 St 7/8 Sc
1200	3⊙ E16⊕	8.0	H	9.2	7.2	20	6.2	1/8 St 8/8 Sc
1300	3⊙ E13⊕	18.0		9.2	6.2	20	6.2	1/8 St 8/8 Sc
YEOVILTON (038530) 51°0' 2°38'W		Elev. 23m 336 Km SW of Track Center						
1000	E25⊕	2.0	H	9.2	8.2	23	4.1	8/8 Sc
1100	E25⊕	9.0	H	9.2	7.2	23	6.2	8/8 Sc
1200	E20⊕	9.0	H	9.2	7.2	23	5.1	8/8 Sc
1300	E20⊕	12.0		9.2	7.2	23	5.7	8/8 Sc
BOURNEMOUTH HURN (038620) 50°47'N 1°50'W		Elev. 11m 302 Km SW of Track Center						
1000	W2⊕	2.0	F-	8.2	8.2	19	3.1	8/8 St
1020	W2⊕	5.0	H	8.2	8.2	20	3.0	8/8 St
1100	E10⊕	6.0	H	9.2	8.2	18	2.6	8/8 St
1120	E15⊕	11.2		10.2	7.2	19	3.0	8/8 St
1200	E20⊕	12.0		10.2	7.2	19	4.1	8/8 Sc
1220	E25⊕	11.2		10.2	6.2	19	4.1	8/8 Sc
1300	E25⊕	18.0		10.2	6.2	21	4.1	8/8 Sc
MILDENHALL (035771) 52°22'N 00°30'E		Elev. 10m 80.4 Km W of Track Center						
1400		11.2		14.2	6.2	22	7.2	3/8 Low Cloud Ceiling 20K'
1500		11.2		12.2	7.2	22	8.7	+Gusts to 11.3 5/8 Low Cloud at 4500 feet
1600		11.2		12.2	7.2	23	6.1	6/8 Low Cloud at 4000 feet

No additional data on cloud layers or heights were defined.

Table 6.3. (Cont.) Standard Meteorological Data Sheet

Time GMT	Sky and Ceiling (Hundreds of Feet)	Visibility (Kilometers)	Weather and Obstructions To Vision	Temp. (°C)	Dewpoint (°C)	Wind Direction (00-36)	Wind Speed (mps)	Remarks
Flight No. C-443								Field Site: Mildenhall
Date: 9 March 1978								Lat. 52°24'N Long. 1°41'E El. Sea Level
BOSCOMBE DOWN (037460) 51°10'N 1°45'W Elev. 124m 273 Km SW of Track Center								
1300	3⊙ E13⊕	18.0		9.2	6.2	20	6.2	1/8 St 8/8 Sc
1400	E13⊕	18.0		9.2	6.2	20	6.2	8/8 Sc
1500	E13⊕	15.0		9.2	6.2	20	6.2	8/8 Sc
1600	E10⊕	15.0		8.2	6.2	21	6.2	8/8 Sc
YEOVILTON (038530) 51°0'N 2°38'W Elev. 23m 336 Km SW of Track Center								
1300	E20⊕	12.0		9.2	7.2	23	5.7	8/8 Sc
1400	E20⊕	10.0		9.2	7.2	22	6.2	8/8 Sc
1500	E20⊕	10.0		9.2	7.2	23	4.1	8/8 Sc
1600	E13⊕	10.0		9.2	7.2	21	4.1	8/8 Sc
BOURNEMOUTH HURN (038620) 50°47'N 1°50'W Elev. 11m 302 Km SW of Track Center								
1300	E25⊕	18.0		10.2	6.2	21	4.1	8/8 Sc
1400	E17⊕	12.0		9.2	6.2	21	4.6	8/8 Sc
1500	E15⊕	15.0		9.2	6.2	22	4.1	8/8 Sc
1600	E15⊕	12.0		9.2	6.2	20	4.6	8/8 Sc
MILDENHALL (035771) 52°22'N 00°30'E Elev. 10m 80.4 Km W of Track Center								
1400		11.2		14.2	6.2	22	7.2	3/8 Low Cloud Ceiling 20K
1500		11.2		12.2	7.2	22	8.7	+Gusts to 11.3 5/8 Low Cloud at 4500 feet
1600		11.2		12.2	7.2	23	6.1	6/8 Low Cloud at 4000 feet
No additional data on cloud layers or heights were defined.								
Flight No. C-444								Field Site: Yeovilton
Date: 11 March 1978								Lat. 50°56'N Long. 2°27'E El. 60m
BOSCOMBE DOWN (037460) 51°10'N 1°45'W Elev. 124m 55.4 Km NE of Track Center								
1200	E5⊙ 220⊙	3.5	H	10.2	9.2	15	3.1	5/8 St 7/8 Ci & Cs
1400	15⊙ E220⊙	6.0	H	13.2	11.2	17	5.1	4/8 Cu 6/8 Ci
1500	90⊙ E250⊙	9.0	H	14.2	9.2	18	6.2	3/8 Ac 7/8 Ci & Cs
1600	25⊙ E90⊙ 250⊙	7.0	H	13.2	9.2	20	5.1	2/8 Cu 5/8 Ac 7/8 Cs
YEOVILTON (038530) 51°0'N 2°38'W Elev. 23m 14.8 Km NW of Track Center								
1200	50⊙ 100⊙ E250⊙	4.0	H	13.2	9.2	21	7.2	1/8 Sc 3/8 Ac 6/8 Ci
1300	50⊙ 100⊙ E250⊙	4.0	H	13.2	9.2	21	7.2	1/8 Sc 3/8 Ac 6/8 Ci
1400	100⊙ E250⊙	4.0	H	15.2	10.2	20	7.2	2/8 Ac 7/8 Ci
1500	35⊙ E250⊙	4.0	H	12.2	9.2	22	6.2	3/8 Sc 7/8 Ci
1600	E25⊙ 250⊙	4.0	H	12.2	9.2	22	5.1	5/8 Sc 7/8 Ci
BOURNEMOUTH HURN (038620) 50°47'N 1°50'W Elev. 11m 46.4 Km ESE of Track Center								
1200	100⊙ E250⊙	4.0	H	12.2	9.2	16	2.1	1/8 Ac 6/8 Ci
1220	100⊙ E250⊙	4.0	H	13.2	9.2	18	2.5	1/8 Ac 6/8 Ci
1300	100⊙ E250⊙	4.0	H	12.2	8.2	16	3.6	1/8 Ac 6/8 Ci
1320	100⊙ E250⊙	4.2	H	12.8	9.2	18	4.1	2/8 Ac 6/8 Ci
1400	100⊙ E250⊙	4.0	H	12.2	8.2	16	3.6	1/8 Ac 6/8 Ci
1420	100⊙ E250⊙	4.7	H	12.2	8.2	15	3.0	1/8 Ac 6/8 Ci
1500	E250⊙	4.5	H	11.2	8.2	17	3.1	7/8 Ci & Cs
1520	60⊙ E250⊙	4.2	H	11.2	9.2	17	2.5	1/8 Ac 7/8 Ci & Cs
1600	E60⊙ 250⊙	4.2	H	11.2	9.2	17	2.6	5/8 Ac 7/8 Cs
Flight No. C-445								Field Site: Soesterberg
Date: 13 March 1978								Lat. 51°56'N Long. 5°35'E El. 6m
DEBILT (062600) 52°6'N 5°12'E Elev. 2m 32.1 Km NW of Track Center								
1000	25⊙ 100⊙ 200⊙	12.0		9.2	0.2	22	5.7	1/8 Cu 1/8 Ac 2/8 Ci
1100	E27⊙ 100⊙ 200⊙	15.0		8.2	3.2	23	8.8	5/8 Cu 6/8 Ac 7/8 Ci
1200	E27⊙ 100⊙	20.0	RW-	8.2	4.2	22	8.2	6/8 Cb 7/8 Ac
1300	E20⊕	4.7	R	7.2	5.2	23	7.7	8/8 Cu & Sc
SOESTERBERG (062650) 52°8'N 5°17'E Elev. 20m 30.3 Km NW of Track Center								
1000	30⊙ 120-⊙ 200-⊙	14.0	H	9.2	4.2	24	7.7	1/8 Cu & Sc 1/8 Ac 1/8 Ci
1100	E23⊙	25.0		9.2	1.2	24	8.8	7/8 Cu & Sc
1129	E27⊙	11.2	RW-	9.2	4.2	23	8.7	7/8 Cu & Sc
1200	E27⊙	8.0	RW-	8.2	3.2	25	7.7	7/8 Cu & Sc
1300	E20⊙	10.0	RW-	6.2	5.2	24	6.2	7/8 Cb
DEELEN (062750) 52°4'N 5°54'E Elev. 48m 26.3 Km NE of Track Center								
1000	15⊙	12.0		8.2	2.2	23	8.2	2/8 Cu
1100	25⊙ 200⊙	12.0		8.2	2.2	24	9.8	3/8 Cu 4/8 Ci
1200	E27⊙ 200⊙	18.0		8.2	5.2	23	10.8	6/8 Cb 7/8 Ci
1300	E48⊕	10.0	RW-	8.2	3.2	25	9.3	8/8 Cb

Table 6.3. (Cont.) Standard Meteorological Data Sheet

Time GMT	Sky and Ceiling (Hundreds of Feet)	Visibility (Kilometers)	Weather and Obstructions To Vision	Temp. (°C)	Dewpoint (°C)	Wind Direction (00-36)	Wind Speed (mps)	Remarks
Flight No. C-446								Field Site: Yeovilton
Date: 15 March 1978								Lat. 50°56'N Long. 2°27'E El. 60m
BOSCOMBE DOWN (037460) 51°10'N 1°45'W Elev. 124m 55.4 Km NE of Track Center								
1000	25◑ E250◑	30.0		9.2	3.2	26	10.8	1/8 Cu 6/8 Ci
1100	25◑ E250◑	30.0		9.2	3.2	26	10.8	1/8 Cu 6/8 Ci
1200	25◑ E220⊕	25.0		9.2	2.2	27	11.8	2/8 Cu 8/8 Cs
1300	25◑ E220⊕	25.0		10.2	2.2	27	9.3	2/8 Cu & Sc 8/8 Cs
YEOVILTON (038530) 51°0'N 2°38'W Elev. 23m 14.8 Km NW of Track Center								
1000	25◑ E120⊕	12.0	H	10.2	5.2	28	10.3	4/8 Cu & Sc 8/8 As
1100	20◑ E220⊕	12.0	H	10.2	4.2	28	11.3	2/8 Cu 8/8 Cs
1200	20◑ E200⊕	15.0	H	11.2	3.2	28	11.3	3/8 Cu & Sc 8/8 Cs
1300	25◑ E250⊕	8.0	H	11.2	3.2	26	8.2	5/8 Cu & Sc 8/8 Cs
BOURNEMOUTH HURN (038620) 50°47'N 1°50'W Elev. 11m 46.4 Km ESE of Track Center								
1000	25◑ 120◑ 200-◍	12.0		11.2	3.2	25	10.3	2/8 Cu & Sc 3/8 As 5/8 Ci Distant R
1050	25◑ 120◑ E200◍	11.2		11.2	4.2	25	9.7+	Gusts 15.4 2/8 Cu 3/8 As 7/8 Ci
1100	25◑ 120◑ E200⊕	15.0		11.2	4.2	25	9.8	2/8 Cu 3/8 As 8/8 Cs
1120	25◑ 120◑ E200⊕	11.2		11.2	3.2	26	10.2	2/8 Cu 3/8 As 8/8 Cs
1200	25◑ E200⊕	15.0		11.2	3.2	25	10.8	1/8 Cu 8/8 Cs
1220	25◑ E200⊕	11.2		11.2	1.2	26	9.2	1/8 Cu 8/8 Cs
1300	25◑ 120◑ E200⊕	11.0		11.2	2.2	25	9.3	2/8 Cu & Sc 3/8 As 8/8 Cs
Flight No. C-447								Field Site: Yeovilton
Date: 15 March 1978								Lat. 50°56'N Long. 2°27'E El. 60m
BOSCOMBE DOWN (037460) 51°10'N 1°45'W Elev. 124m 55.4 Km NE of Track Center								
1300	35◑ E220⊕	25.0		10.2	2.2	29	9.3	2/8 Cu & Sc 8/8 Cs
1400	35◑ E220⊕	25.0		10.2	2.2	27	9.3	2/8 Cu & Sc 8/8 Cs
1500	30◑ E220⊕	25.0		9.2	3.2	24	6.7	3/8 Cu 8/8 Cs
YEOVILTON (038530) 51°0'N 2°38'W Elev. 23m 14.8 Km NW of Track Center								
1300	30◑ E250⊕	8.0	H	11.2	3.2	26	8.2	2/8 Cu & Sc 8/8 Cs
1400	30◑ 120◑ E250⊕	12.0	H	11.2	4.2	24	7.7	2/8 Cu & Sc 4/8 As 8/8 Cs
1500	30◑ E120◑ 250⊕	12.0	H	11.2	3.2	24	6.7	2/8 Cu & Sc 5/8 As 8/8 Cs
BOURNEMOUTH HURN (038620) 50°47'N 1°50'W Elev. 11m 46.4 Km ESE of Track Center								
1300	25◑ 120◑ E200⊕	11.0		11.2	2.2	25	9.3	2/8 Cu & Sc 3/8 As 8/8 Cs
1320	25◑ E130◑ 200⊕	11.2		10.2	5.2	23	9.2	2/8 Cu & Sc 5/8 As 8/8 Cs
1400	25◑ E130⊕	15.0		10.2	5.2	24	9.3	1/8 Cu & Sc 8/8 As
1420	25◑ E130⊕	11.2		10.2	5.2	23	8.2	1/8 Cu & Sc 8/8 As
1500	25◑ E150⊕	15.0		10.2	4.2	23	8.2	1/8 Cu & Sc 8/8 As
Flight No. C-448								Field Site: Yeovilton
Date: 17 March 1978								Lat. 50°56'N Long. 2°27'E El. 60m
BOSCOMBE DOWN (037460) 51°10'N 1°45'W Elev. 124m 55.4 Km NE of Track Center								
1000	E30◍	30.0	RW--	4.2	-0.8	36	7.2	7/8 Cu & Sc
1100	E28◑	25.0		3.2	-0.8	36	6.7	7/8 Cu & Sc
1200	30◑ E220◍	30.0		5.2	-1.8	01	6.2	4/8 Cu & Sc 6/8 Ci
1300	30◑ E220◍	30.0		6.2	-3.8	01	6.7	4/8 Cu & Sc 6/8 Ci
1400	E40◍ 220◍	20.0		5.2	-2.8	01	6.2	7/8 Cu & Sc 7/8 Ci
1500	40◑ E250◍	25.0		6.2	-2.8	34	5.7	4/8 Cu 7/8 Ci RW Distant
YEOVILTON (038530) 51°0'N 2°38'W Elev. 23m 14.8 Km NW of Track Center								
1000	E20◍	10.0	H	4.2	0.2	04	7.2	7/8 Cu
1100	E22◍	12.0	H	5.2	1.2	03	5.1	7/8 Cu & Sc
1200	25◑ 200-◍	14.0	H	5.2	0.2	01	6.2	4/8 Cu & Sc 5/8 Ci
1300	E25◍ 200-◍	14.0	H	6.2	-1.8	03	6.2	5/8 Cu & Sc 6/8 Ci
1400	25◑ 200-◍	14.0	H	6.2	-2.8	01	5.7	3/8 Cu & Sc 6/8 Ci
1500	E28◍ 200-◍	12.0	H	7.2	-1.8	04	7.7	5/8 Cu & Sc 6/8 Ci
BOURNEMOUTH HURN (038620) 50°47'N 1°50'W Elev. 11m 46.4 Km ESE of Track Center								
1000	E15◍	15.0		4.2	1.2	36	7.7	6/8 Cu & Sc
1020	E16◍	11.2	SW-	5.2	-0.8	36	8.2	6/8 Cu & Sc
1100	E18◍	15.0		5.2	-0.8	35	8.2	6/8 Cu & Sc
1200	E18◍	15.0		5.2	-0.8	35	8.2	6/8 Cu & Sc
1300	18◑ 200-◍	13.0		7.2	-0.8	35	7.2	4/8 Cu & Sc 5/8 Ci
1400	20◑ E250◍	25.0		6.2	-2.8	36	7.7	3/8 Cu & Sc 7/8 Ci
1500	20◑ 120-◍ E250◍	20.0		6.2	3.2	36	6.2	4/8 Cu & Sc 6/8 Ac 7/8 Ci

Table 6.3. (Cont.) Standard Meteorological Data Sheet

Time GMT	Sky and Ceiling (Hundreds of Feet)	Visibility (Kilometers)	Weather and Obstructions To Vision	Temp. (°C)	Dewpoint (°C)	Wind Direction (00-36)	Wind Speed (mps)	Remarks
Flight No. C-449								Field Site: Yeovilton
Date: 18 March 1978								Lat. 50°56'N Long. 2°27'E El. 60m
BOSCOMBE DOWN (037460) 51°10N 1°45'W Elev. 124m 55.4 Km NE of Track Center								
0900	E250Ⓓ	8.0	H	1.2	-0.8	19	1.0	7/8 Ci
1000	250Ⓓ	14.0		4.2	0.2	26	2.6	3/8 Ci
1100	45Ⓓ 250Ⓓ	25.0		5.2	-1.8	26	5.7	2/8 Cu 3/8 Ci
1200	45Ⓓ E250Ⓓ	25.0		7.2	-1.8	24	4.6	1/8 Cu 5/8 Ci
1300	45Ⓓ 250Ⓓ	28.0		7.2	-2.8	26	4.6	1/8 Cu 2/8 Ci
1400	E45Ⓓ 250Ⓓ	30.0		8.2	-2.8	26	2.6	5/8 Cu 6/8 Ci
YEOVILTON (038530) 51°0'N 2°38'W Elev. 23m 14.8 Km NW of Track Center								
0900	E20Ⓓ	12.0	H	3.2	-0.8	03	9.3	7/8 Sc
1000	E20Ⓓ	10.0	H	4.2	0.2	04	7.2	7/8 Sc
1100	E22Ⓓ	12.0	H	5.2	1.2	03	5.1	7/8 Sc
1200	22Ⓓ 200-Ⓓ	14.0	H	5.2	0.2	01	6.2	4/8 Cu & Sc 5/8 Ci
1300	E25Ⓓ 200Ⓓ	14.0	H	6.2	-1.8	03	6.2	5/8 Cu & Sc 6/8 Ci
1400	E25Ⓓ 200Ⓓ	14.0	H	6.2	-2.8	01	5.7	5/8 Cu & Sc 6/8 Ci
BOURNEMOUTH HURN (038620) 50°47'N 1°50'W Elev. 11m 46.4 Km ESE of Track Center								
0900	E250Ⓓ	6.0	H	2.2	-1.8	24	1.0	6/8 Ci
1000	40Ⓓ E250Ⓓ	8.0	H	6.2	-2.8	24	1.0	1/8 Cu 5/8 Ci
1100	40Ⓓ 250Ⓓ	18.0		7.2	-2.8	25	3.1	1/8 Cu 4/8 Ci
1200	40Ⓓ 250-Ⓓ	25.0		8.2	0.2	21	4.6	3/8 Cu 5/8 Ci
1300	E35Ⓓ 250Ⓓ	25.0		8.2	-0.8	24	4.1	5/8 Cu 6/8 Ci
1400	E35Ⓓ 250Ⓓ	30.0		8.2	-0.8	24	3.6	5/8 Cu 6/8 Ci
Flight No. C-450								Field Site: Soesterberg
Date: 22 March 1978								Lat. 51°56'N Long. 5°35'E El. 6m
DEBILT (062600) 52°6'N 5°12'E Elev. 2m 32.1 Km NW of Track Center								
0900	15Ⓓ 100Ⓓ E200Ⓓ	5.0	F-	6.2	3.2	22	3.1	2/8 Cu 3/8 Ac 6/8 Ci
1000	15Ⓓ 100Ⓓ E200Ⓓ	5.0	F-	7.2	2.2	22	5.1	3/8 Cu 4/8 Ac 7/8 Ci
1100	15Ⓓ 100Ⓓ E200Ⓓ	7.0	H	7.2	2.2	23	7.7	3/8 Cu 4/8 Ac 7/8 Ci
1200	20Ⓓ 100Ⓓ E200Ⓓ	10.0	H	8.2	2.2	23	7.7	3/8 Cu 4/8 Ac 7/8 Ci
SOESTERBERG (062650) 52°8'N 5°17'E Elev. 20m 30.3 Km NW of Track Center								
0900	15Ⓓ 100Ⓓ E200Ⓓ	12.0		5.2	5.2	22	4.1	2/8 Cu 4/8 Ac 7/8 Ci
1000	E12Ⓓ 100Ⓓ 200Ⓓ	15.0		7.2	4.2	21	5.7	5/8 Cu 6/8 Ac 7/8 Ci
1029	12Ⓓ 100Ⓓ E200Ⓓ	11.2		7.2	3.2	24	5.6	3/8 Cu 4/8 Ac 7/8 Ci
1100	20Ⓓ 100Ⓓ E200Ⓓ	15.0		7.2	1.2	22	6.2	3/8 Cu 4/8 Ac 7/8 Ci
1200	20Ⓓ 100Ⓓ E200Ⓓ	16.0		8.2	2.2	24	6.2	3/8 Cu 4/8 Ac 7/8 Ci
DEELEN (062750) 52°4'N 5°54'E Elev. 48m 26.3 Km NE of Track Center								
0900	2Ⓓ 200-Ⓓ	4.7	F	4.2	3.2	22	5.1	4/8 Cu 6/8 Ci
1000	8Ⓓ 200-Ⓓ	10.0		6.2	3.2	22	7.2	4/8 Cu 6/8 Ci
1100	30Ⓓ 200-Ⓓ	15.0		7.2	1.2	24	8.8	4/8 Cu & Sc 7/8 Ci
1200	30Ⓓ E200Ⓓ	15.0		8.2	1.2	21	8.8	4/8 Cu 7/8 Ci
Flight No. C-451								Field Site: Meppen
Date: 22 March 1978								Lat. 53°00'N Long. 7°37'E El. 18m
BERGEN (102350) 53°0'N 9°51'E Elev. 77m 149 Km E of Track Center								
1200	E50Ⓓ	20.0		4.2	-0.8	25	3.1	7/8 Cu & Sc
1300	E25Ⓓ	20.0		5.2	0.2	24	3.0	6/8 Sc
1400	E25Ⓓ	25.0		6.2	0.2	26	5.6	5/8 Sc
1500	E25Ⓓ	25.0		7.2	-0.8	27	4.6	5/8 Sc
MUNSTER (103130) 51°58'N 7°37'E Elev. 64m 115 Km S of Track Center								
1200	E21Ⓓ 200Ⓓ	20.0		7.2	1.2	22	5.1	6/8 Cu 6/8 Ci
1300	E27Ⓓ 200Ⓓ	25.0		8.2	0.2	22	5.6	6/8 Cu 6/8 Ci
1400	E28Ⓓ 200Ⓓ	25.0		8.2	0.2	22	4.6	5/8 Cu 6/8 Ci
1500	E30Ⓓ 200Ⓓ	25.0		8.2	0.2	22	5.7	5/8 Cu 6/8 Ci
OSNABRUCK (103170) 52°15'N 8°4'E Elev. 95m 88.8 Km SE of Track Center								
1200	E26Ⓓ 200-Ⓓ	30.0		6.2	-0.8	25	5.7	6/8 Cu 6/8 Ci
1300	E26Ⓓ 200-Ⓓ	25.0		7.2	-0.8	22	6.6	5/8 Cu 5/8 Ci
1400	E26Ⓓ 200-Ⓓ	20.0		7.2	0.2	21	5.1	5/8 Cu 6/8 Ci
1500	E26Ⓓ 200-Ⓓ	20.0		8.2	0.2	22	5.1	5/8 Cu 6/8 Ci
EMDEN (102030) 53°20'N 7°13'E Elev. 6m 45.7 Km NW of Track Center								
1200	15Ⓓ 200-Ⓓ	12.0		7.2	2.2	22	6.7	4/8 Cu 5/8 Ci
1300	E15Ⓓ	15.0		7.2	1.2	21	8.2	5/8 Cu
1400	E18Ⓓ	15.0		8.2	1.2	21	10.2	6/8 Cu
1500	E18Ⓓ	10.0		8.2	1.2	21	10.3	7/8 Cu

Table 6.3. (Cont.) Standard Meteorological Data Sheet

Time GMT	Sky and Ceiling (Hundreds of Feet)	Visibility (Kilometers)	Weather and Obstructions To Vision	Temp. (°C)	Dewpoint (°C)	Wind Direction (00-36)	Wind Speed (mps)	Remarks
Flight No. C-452								Field Site: Meppen
Date: 23 March 1978								Lat. 53°00'N Long. 7°37'E El. 18m
BERGEN (102350) 53°0'N 9°51'E		Elev. 77m	149 Km E of Track Center					
1400	15Ⓓ E20Ⓓ	35.0		7.2	-0.8	25	7.2	1/8 Cu 7/8 Sc
1500	15Ⓓ E25Ⓓ	35.0		8.2	-2.8	26	5.7	1/8 Cu 7/8 Sc
1600	15Ⓓ E25Ⓓ	35.0		4.2	0.2	24	9.2	2/8 Cu 7/8 Sc
MUNSTER (103130) 51°58'N 7°37'E		Elev. 64m	115 Km S of Track Center					
1400	E13Ⓓ 200Ⓓ	35.0	RW-	6.2	0.2	22	8.2	6/8 Cu 7/8 Ci
1500	E10Ⓓ 100Ⓓ 200Ⓓ	35.0	TRW	7.2	3.2	24	5.1	6/8 Cb 7/8 Ac 7/8 Ci
1600	15Ⓓ 100Ⓓ 200-Ⓓ	40.0		4.2	0.2	23	6.1	1/8 Cu 4/8 Ac 6/8 Ci
OSNABRUCK (103170) 52°15'N 8°4'E		Elev. 95m	88.8 Km SE of Track Center					
1400	E23Ⓓ	30.0	TRW	6.2	1.2	23	9.2	7/8 Cb
1500	15Ⓓ E26Ⓓ	40.0		3.2	1.2	24	6.7	2/8 Cu 7/8 Cb
1600	15Ⓓ E26Ⓓ	40.0		4.2	0.2	23	6.1	1/8 Cu 6/8 Cb
EMDEN (102030) 53°20'N 7°13'E		Elev. 6m	45.7 Km NW of Track Center					
1400	E30Ⓓ	20.0	R-	6.2	0.2	25	14.4	7/8 Fs
1500	E10⊕	8.0	R-	3.2	3.2	25	14.9	8/8 Fs
1600	10Ⓓ E40Ⓓ	17.0		5.2	4.2	24	9.2	2/8 Fs 7/8 Fc
Flight No. C-453								Field Site: Meppen
Date: 28 March 1978								Lat. 53°00'N Long. 7°37'E El. 18m
BERGEN (102350) 53°0'N 9°51'E		Elev. 77m	149 Km E of Track Center					
0800	25Ⓓ E250Ⓓ	15.0		8.2	7.2	25	5.1	1/8 Sc 7/8 Ci
0900	25Ⓓ E250Ⓓ	15.0		9.2	6.2	25	5.1	3/8 Cu & Sc 7/8 Ci
1000	E20Ⓓ 250Ⓓ	15.0		11.2	5.2	24	5.1	5/8 Cu & Sc 7/8 Ci
1100	20Ⓓ E250Ⓓ	18.0		11.2	5.2	24	4.6	4/8 Cu & Sc 7/8 Ci
1200	E40Ⓓ 100Ⓓ	18.0		12.2	6.2	24	5.1	6/8 Cu & Sc 7/8 Ac
MUNSTER (103130) 51°58'N 7°37'E		Elev. 64m	115 Km S of Track Center					
0800	E30Ⓓ	15.0		9.2	6.2	21	3.0	6/8 Sc
0900	E33Ⓓ	15.0		10.2	6.2	21	3.1	7/8 Sc
1000	E30Ⓓ	15.0		10.2	6.2	21	2.5	7/8 Sc
1100	E33⊕	10.0		11.2	6.2	18	2.0	8/8 Sc
1200	E33⊕	12.0		12.2	9.2	18	2.1	8/8 Sc
OSNABRUCK (103170) 52°15'N 8°4'E		Elev. 95m	88.8 Km SE of Track Center					
0800	E23⊕	15.0		8.2	5.2	20	4.6	8/8 Sc
0900	E40Ⓓ	12.0		10.2	6.2	21	5.7	7/8 Sc
1000	E26Ⓓ	12.0		10.2	6.2	21	4.6	7/8 Sc
1100	E26Ⓓ	12.0		11.2	7.2	21	4.6	7/8 Sc
1200	E26Ⓓ	10.0		12.2	8.2	20	4.6	7/8 Sc
EMDEN (102030) 53°20'N 7°13'E		Elev. 6m	45.7 Km NW of Track Center					
0800	E8⊕	6.0	F-	7.2	5.2	23	8.2	8/8 St
0900	E240Ⓓ	7.0	F-	8.2	6.2	22	6.7	6/8 Ci
1000	E11⊕	7.0	F-	8.2	5.2	22	8.2	8/8 Sc
1100	E18⊕	7.0	F-	9.2	6.2	20	7.2	8/8 Sc
1200	E18⊕	8.0		9.2	6.2	20	6.7	8/8 Sc
Flight No. C-454								Field Site: Rodby
Date: 28 March 1978								Lat. 54°41'N Long. 11°08'E El. Sea Level
KEGNAES (061190) 54°51'N 10°0'E		Elev. 23m	75.0 Km WNW of Track Center					
0900	E170Ⓓ	5.0	F-	5.2	4.2	24	6.2	7/8 Ci & Cs
1200	30Ⓓ 170Ⓓ	7.0	F-	8.2	5.2	24	8.2	3/8 Sc 4/8 Ci
1500	E80⊕	7.0	F-	8.2	4.2	23	10.3	8/8 Ac
GEDSER REV (061470) 54°25'N 12°11'E		Elev. 1m	73.9 Km E of Track Center					
1200	200-Ⓓ	4.5	F-	7.2	4.2	23	7.2	4/8 Ci
1500	35Ⓓ E100⊕	6.0	F-	7.2	4.2	20	5.1	2/8 Sc 8/8 Ac
FEHMARNBELT (100060) 54°36'N 11°11'E		Elev. 4m	9.8 Km S of Track Center					
1200	120Ⓓ 200-Ⓓ	10.0		6.2	4.2	22	9.3	4/8 Ac 6/8 Ci
1500	120Ⓓ 200-Ⓓ	10.0		8.2	4.2	20	7.7	4/8 Ac 7/8 Ci

Table 6.3. (Cont.) Standard Meteorological Data Sheet

Time GMT	Sky and Ceiling (Hundreds of Feet)	Visibility (Kilometers)	Weather and Obstructions To Vision	Temp. (°C)	Dewpoint (°C)	Wind Direction (00-36)	Wind Speed (mps)	Remarks
Flight No. C-456 a & b								Field Site: Rodby
Date: 31 March 1978								Lat. 54°41'N Long. 11°8'E El. Sea Level
KEGNAES (061190) 54°51'N 10°0'E Elev. 23m 75.0 Km WNW of Track Center								
1200	E100◍ 200◍	15.0		10.2	6.2	05	5.1	6/8 Ac 7/8 Ci
1500	E90⊕	15.0		8.2	5.2	07	4.1	8/8 As
GEDSER REV (061470) 54°25'N 12°11'E Elev. 1m 73.9 Km E of Track Center								
1200	E100⊕	22.0		5.2	4.2	02	5.1	8/8 Ac
1500	E15◍ 100⊕	22.0		6.2	5.2	09	3.1	7/8 St 8/8 Ac
FEHMARNBELT (100060) 54°36'N 11°11'E Elev. 4m 9.8 Km S of Track Center								
1200	E15◍	10.0		5.2	3.2	36	2.1	7/8 Cu & Sc
1800	E15⊕	10.0		5.2	4.2	18	4.1	8/8 Cu & Sc

Also included in this section are portions of several satellite photographs, typical of those received from ETAC, which illustrate cloud conditions encountered during the OPAQUE IV deployment. Even though photographs for each flight interval have been evaluated as illustrated in Table 6.4, only four samples have been reproduced for inclusion in this report. In order to identify the entire flight interval to be associated with each satellite photograph, the flight times listed in Table 6.4 have been expanded to reflect take-off to landing times as extracted from the original flight logs. These times are therefore slightly longer than the data intervals identified in Section 7. The four photographs selected for inclusion are shown as Fig. 6-4 and represent the cloud conditions encountered during Flights C-430, C-435 and C-436, C-442 and C-443, and C-453 and C-454.

Table 6.4. Satellite Cloud Cover Comparisons

Flight	Date	Flight Times GMT	Map Time GMT	Track Flown	OPAQUE IV Flight Track Conditions					
					Trapani	Birkhof	Yeovilton	Soesterberg	Meppen	Rodby
C-430	31 JAN 78	1346-1707	1311	Trapani	Thin clouds	Thin clouds	Cloudy	Cloudy	Cloudy	Cloudy
C-431	1 FEB 78	0945-1435	1310	Trapani	Thin clouds	Partly cloudy	Partly cloudy	Cloudy	Cloudy	Cloudy
C-432	3 FEB 78	1125-1505	1300	Trapani	Thin clouds	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy
C-433	17 FEB 78	1030-1315	1310	Sigonella	Thin clouds	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy
C-434	18 FEB 78	0913-1510	1310	Sigonella	Thin clouds	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy
C-435	23 FEB 78	0800-1045	1310	Birkhof	Thin clouds	Thin clouds	Cloudy	Cloudy	Cloudy	Cloudy
C-436	23 FEB 78	1255-1530	1300	Birkhof	Thin clouds	Thin clouds	Cloudy	Cloudy	Cloudy	Cloudy
C-437	27 FEB 78	0900-1359	1310	Birkhof	Thin clouds	Thin clouds	Cloudy	Cloudy	Cloudy	Cloudy
C-438	1 MAR 78	0836-1038	1310	Birkhof	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy
C-439	1 MAR 78	1213-1510	1310	Birkhof	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy
C-440	2 MAR 78	1025-1525	1310	Birkhof	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy
C-441	3 MAR 78	1450-1705	1310	Birkhof	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy
C-442	9 MAR 78	1014-1405	1310	Mildenhall	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy
C-443	9 MAR 78	1410-1600	1310	Mildenhall	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy
C-444	11 MAR 78	1203-1630	0159	Yeovilton	Clear	Thin clouds	Cloudy	Thin clouds	Thin clouds	Cloudy
C-445	13 MAR 78	1003-1327	1310	Soesterberg		Cloudy	Cloudy	Cloudy	Cloudy	Cloudy
C-446	15 MAR 78	1015-1240	-	Yeovilton	MSG					
C-447	15 MAR 78	1245-1506	-	Yeovilton	MSG					
C-448	17 MAR 78	0958-1452	-	Yeovilton	MSG					
C-449	18 MAR 78	0858-1420	-	Yeovilton	MSG					
C-450	22 MAR 78	0852-1244	1309	Soesterberg	Scattered clouds	Thin clouds	Cloudy	Thin clouds	Thin clouds	Thin clouds
C-451	22 MAR 78	1247-1449	1309	Meppen	Scattered clouds	Thin clouds	Cloudy	Thin clouds	Thin clouds	Thin clouds
C-452	23 MAR 78	1358-1608	1309	Meppen	Clear	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy
C-453	28 MAR 78	0806-1000	1309	Meppen	Clear	Clear	Cloudy	Cloudy	Cloudy	Cloudy
C-454	28 MAR 78	1045-1419	1309	Rodby	Clear	Clear	Cloudy	Cloudy	Cloudy	Cloudy
C-456A	31 MAR 78	1205-1419	1310	Rodby	Cloudy	Cloudy	Thin clouds	Cloudy	Cloudy	Cloudy
C-456B	31 MAR 78	1423-1638	1310	Rodby	Cloudy	Cloudy	Thin clouds	Cloudy	Cloudy	Cloudy

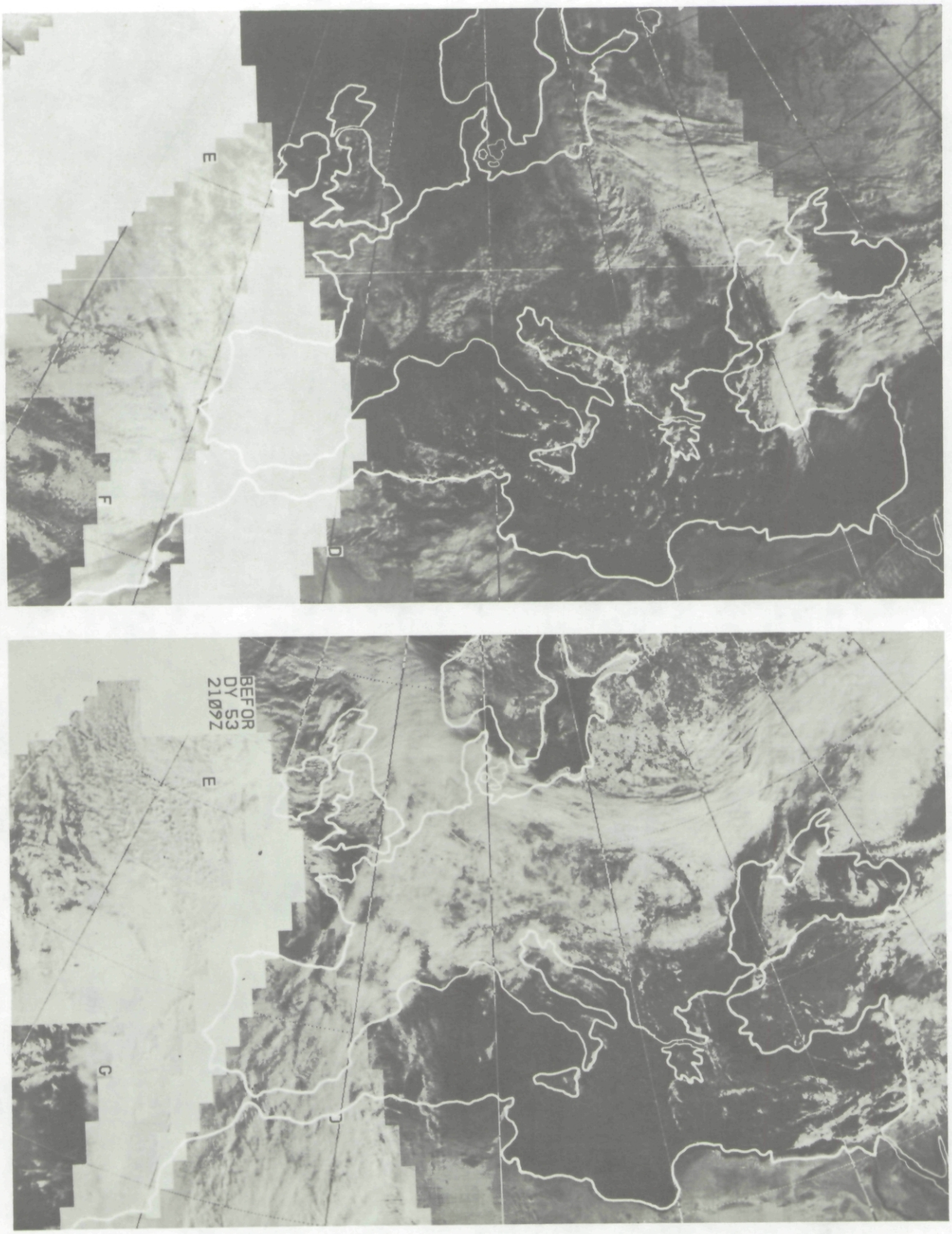


Fig. 6-4a. Satellite Photographs for 31 January 1978, 1311 GMT, Reference Flt. C-430 (Upper) and for 23 February 1978, 1310 GMT, Reference Flt. C-435 and C-436 (Lower)

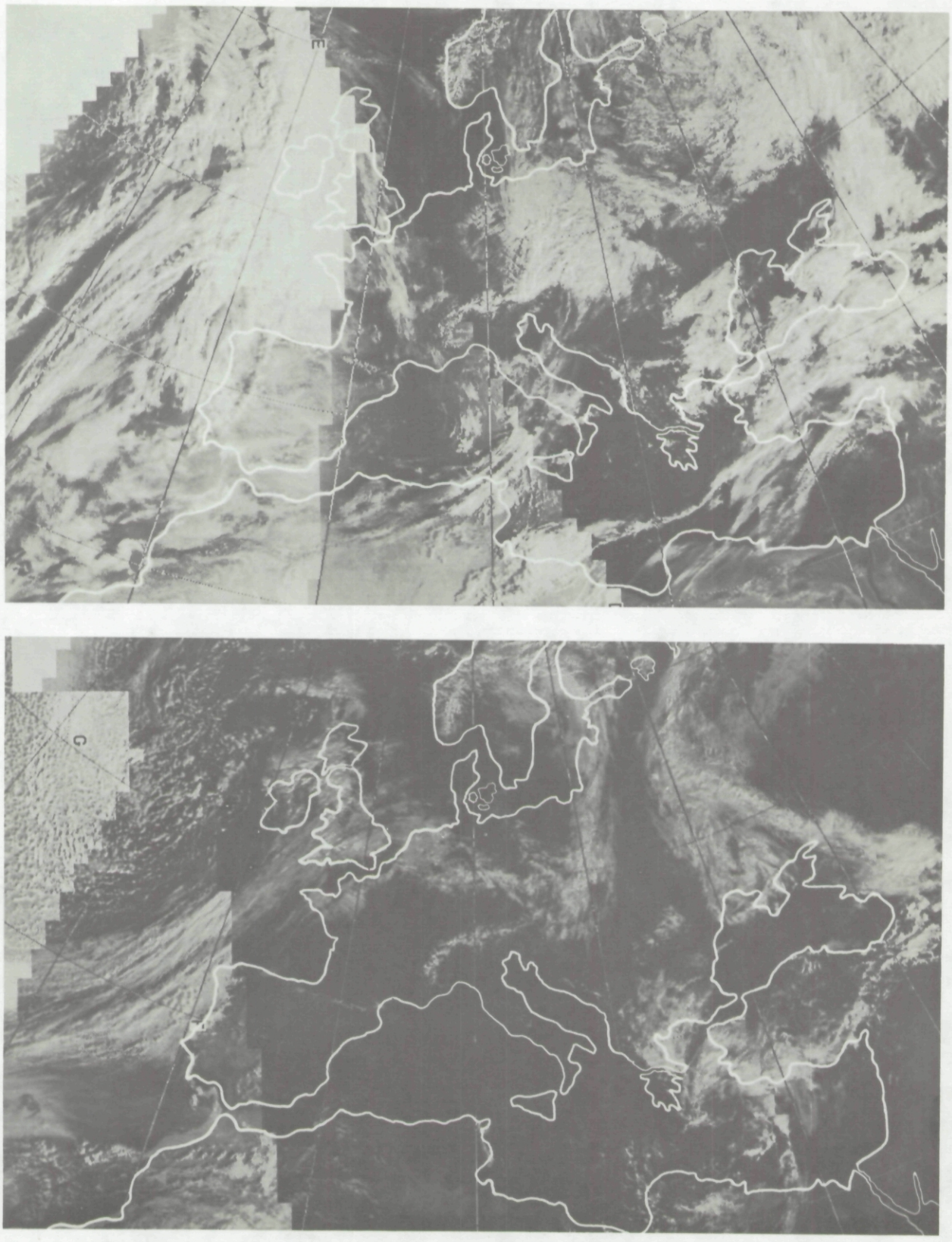


Fig. 6-4b. Satellite Photographs for 9 March 1978, 1310 GMT, Reference Flt. C-442 and C-443 (Upper) and for 28 March 1978, 1311 GMT, Reference Flt. C-453 and C-454 (Lower)

7. DATA PRESENTATION

7.1. AIRBORNE DATA AND FLIGHT SUMMARY

Between 31 January and 31 March 1978, twenty-seven flights were made in northern Europe. Twenty-six of these flights contain useable data profiles. Selected data for these flights are reported herein.

The 26 flights were conducted in northern Europe on eight flight tracks in Sicily, Germany, the Netherlands, England and Denmark (see Fig. 1-1). The latitude, longitude, and altitude of each flight track are given in Table 7.1. The terrain beneath three of the flight tracks, those in northern Germany, the Netherlands and England, was low lying and flat, mostly cultivated farmland. The southern Germany track was over a high snow covered plateau, while the flight tracks in Sicily, Denmark were mostly over water.

The ground station operated from 3 February to 31 March 1978 near the flight tracks in Sicily, Germany and England, but was not utilized during the flights in Denmark and the Netherlands. Its location and dates of operation are also noted in Table 7.1.

Table 7.1. Location and Ground Elevation of Flight Tracks and Ground Sites

Field Site	Latitude	Longitude	Approximate Ground Elevation (meters)	Dates of Operation (1978)	Flight No.
FLIGHT TRACK					
Trapani, Sicily	37°33'N	12°30'E	Sea Level	Jan 31 Feb 1,3	430 431,432
Sigonella, Sicily	37°24'N	15°20'E	Sea Level	Feb 17,18	433,434
Birkhof, Germany	48°15'N	09°05'E	762	Feb 23,27 Mar 1,2,3	435,436,437 438,439,440,441
Mildenhall, England	52°24'N	01°41'E	Sea Level	Mar 9	442,443
Yeovilton, England	50°56'N	02°27'W	60	Mar 11,15,17,18	444,446,447,448,449
Soesterberg, Netherlands	51°56'N	05°35'E	6	Mar 13,22	445,450A,450B
Meppen, Germany	53°00'N	07°37'E	18	Mar 22,23,28	451,452,453
Rodby, Denmark	54°41'N	11°08'E	Sea Level	Mar 28,31	454,456A,456B
GROUND STATION					
Trapani, Sicily	37°55'N	12°29'E		Feb 3,4,6,10,11	
Sigonella, Sicily	37°24'N	14°55'E		Feb 17,18	
Birkhof, Germany	48°13'N	09°11'E		Feb 27,28 Mar 1,2,3	
Memmingen, Germany	47°59'N	10°13'E			
Yeovilton, England	51°01'N	02°37'W		Mar 9,10,11,15,17	
Meppen, Germany	52°52'N	07°23'E		Mar 22,28,30,31	

PHOTOGRAPHIC DOCUMENTATION

Sky and terrain conditions encountered during the data flights were documented photographically during each straight and level flight sequence, at each of several designated altitudes, in conjunction with the radiometric measurements made in each spectral filter. On sunlit days the documentary photographs were taken simultaneously with the measurements made by the upper hemisphere scanner in the sun mode. On overcast days the photographs were taken simultaneously with the measurements of sky and terrain radiance. One should be aware that while the photographs are instantaneous, the data measurements require a four-minute interval for completion. In four minutes the aircraft travels approximately ten miles.

The photographs illustrating upper and lower hemisphere conditions during each of the 26 flights have been examined and classified with respect to discernible cloud conditions. A summary of these general cloud and terrain descriptions, augmented by the descriptions given by the on-board meteorologist, is presented in Table 7.2.

The upper hemisphere cloud conditions for each flight appear to fall into four very general categories: (1) mostly clear to scattered clouds; (2) mostly scattered to broken clouds; (3) mostly broken clouds to overcast; (4) mostly overcast.

Photographs illustrating typical sky and terrain conditions during four of the flights reported herein are shown in Figs. 7-1 and 7-2. In each instance, the picture on the left represents the sky (upper hemisphere) as seen through a 180-degree lens, and the picture on the right represents the terrain (lower hemisphere). The photographs were selected to represent the conditions encountered at both the highest and lowest flight altitudes during each of the four flights.

The pictures representing flight C-432 (Fig. 7-1) illustrate the mostly clear to scattered clouds, the conditions of category one, and the Trapani flight track. The track was over the ocean near the west coast of Sicily.

The pictures representing flight C-433 (Fig. 7-2) illustrate the cloud conditions of category two. Flight C-433 was over the Sigonella track, also in Sicily, which was mostly over water off the east coast of the island.

The second half of flight C-437 during the Filter 4 and 5 data interval, (Fig. 7-1) illustrates category three. It was over the Birkhof track in southern Germany. The underlying terrain was mostly snow covered farmlands interspersed with woods and valleys.

The pictures representing the first half of flight C-440 during the Filter 2 and 3 data interval, (Fig. 7-2) illustrate the mostly overcast conditions of category four. Flight C-440 was also over the Birkhof track in southern Germany.

Table 7.2. Summary of Hemispherical Pictures and In-Flight Meteorologists Descriptions

UPPER HEMISPHERE

○ Clear ◔ Scattered ◍ Broken ⊕ Overcast - Thin V varying

Flight No.	Track	Satellite Picture	Filter No.	~300m (30-510m)	~1500m (720-2100m)	~3000m (2160-4020m)	~5200m (4230-6150m)
C-430**	Trapani	Thin Clouds	2 3 4 5	◔ ◍ ◔ ◔			○ ○ ○ ○
C-431	Trapani	Thin Clouds	2,3 4,5	◔ ⊕	◔ ⊕	◍ ⊕	
C-432	Trapani	Thin Clouds	4,5,2,3	◔			○
C-433**	Sigonella	Thin Clouds	2 3 4 5	◍ ◍ ◍ ◍	◍ ◍ ◍ ◍		
C-434	Sigonella	Thin Clouds	2,3 4,5	◔ ◔	◔ ◔	○ ◔	◔ ◔
C-435	Birkhof	Thin Clouds	2,3 4,5	⊕ ⊕		⊕ ⊕	
C-436	Birkhof	Thin Clouds	2,3 4,5	⊕ ⊕	⊕ ⊕		
C-437	Birkhof	Thin Clouds	2,3 4,5	◔ ◍	◔ ◍	◔ ◍	◔V◔ ⊕
C-438	Birkhof	Cloudy	2	◍	◍		
C-439	Birkhof	Cloudy	2,3 4,5	◍ ⊕	◍ ⊕		
C-440	Birkhof	Cloudy	4,5 2,3	◍ ⊕	◍ ⊕	⊕ ⊕	◍ ⊕
C-441**	Birkhof	Cloudy	2,3 4,5	◔ ◔			◔ ◔
C-442**	Mildenhall	Cloudy	2 3 4 5	◍ ⊕ ⊕ ⊕			⊕ ⊕ ⊕ ⊕
C-443	Mildenhall	Cloudy	2,3 4,5	⊕ ⊕	⊕ ⊕		
C-444	Yeovilton	Cloudy	2,3 4,5	⊕ ⊕	⊕ ⊕	⊕ ⊕	
C-445**	Soesterberg	Cloudy	2 3 4 5	◔ ◍ ⊕ ⊕	 ⊕ ⊕		○ ○
C-446	Yeovilton	Missing	2,3 4,5	⊕ ⊕	⊕ ⊕		
C-447	Yeovilton	Missing	2 3 4 5	⊕ ⊕ ⊕ ⊕		⊕ ⊕ ⊕ ⊕	
C-448**	Yeovilton	Missing	2 3 4 5	◍ ◍ ◍ ◍			◍ ◍ ◍ ◍
C-449	Yeovilton	Missing	2,3 4,5	◔ -◍	◔ -◍	-◍ -◍	-◍ -◍
C-450A**	Soesterberg	Thin Clouds	2,3 4 5	◍ ◍ ◍		-◍ ◍ ◍	
C-450B	Soesterberg	Thin Clouds	2,3 4,5	⊕ ⊕	-⊕ ⊕		
C-451**	Meppen	Thin Clouds	2 3 4 5	◍ ◔V◍ ◔V◍ ◔V◍			◔ ◔ ◔ ◔
C-452**	Meppen	Cloudy	2 3 4 5	◍ ⊕ ⊕ ⊕	 ⊕ ⊕		⊕ ⊕
C-453**	Meppen	Cloudy	2 3 4 5	◔V⊕ ⊕ ⊕ ⊕		⊕ ⊕ ⊕ ⊕	

**Meteorological description incomplete

Table 7.2 (cont.). UPPER HEMISPHERE

Clear Scattered Broken Overcast - Thin V varying

Flight No.	Track	Satellite Picture	Filter No.	~300m (30-510m)	~1500m (720-2100m)	~3000m (2160-4020m)	~5200m (4230-6150m)
C-454	Rodby	Cloudy	2,3 4,5	⊕ ⊕	⊕ ⊕	⊕ ⊕	⊕ ⊕
C-456A	Rodby	Cloudy	2,3 4,5	⊕ ⊕	⊕ ⊕		
C-456B**	Rodby	Cloudy	2 3 4 5	⊕ ⊕ ⊕ ⊕		⊕ ⊕ ⊕ ⊕	

**Meteorological description incomplete

Table 7.2 (cont.). LOWER HEMISPHERE

Flight No. and Track	Filter No.	~300m (30-510m)		~1500m (720-2100m)		~3000m (2160-4020m)		~5700m (4230-6150m)	
		Clouds	Haze	Clouds	Haze	Clouds	Haze	Clouds	Haze
C-430** shallow water coast nearby	2 3 4 5	O O O O	Moderate Moderate Moderate Moderate					⊕ ⊕ ⊕ ⊕	Moderate Moderate Moderate Moderate
C-431 shallow water coast nearby	2,3 4,5	O O	Light Light	⊕ ⊕	Light Light	⊕ ⊕	Light Light		
C-432 shallow water coast nearby	4,5,2,3	O	Light					⊕	Light
C-433** deep water/ coast one end	2 3 4 5	O O O O	Light Light Light Light	O O O O	Light Light Light Light				
C-434 deep water coast one end	2,3 4,5	O O	Light Light	O O	Light Light	O ⊕	Light Light	O O	Light Light
C-435 Forest/snow	2,3 4,5	O O	Very Light Very Light			O O	Very Light Very Light		
C-436 Forest/snow	2,3 4,5	O O	Light Light	O O	Light Light				
C-437 Forest/Snow	2,3 4,5	O V ⊕* O	Light Light	O V ⊕* O	Light Light	O V ⊕* O	Light Light	O O	Light Light
C-438 Forest/Snow Bare Ground	2	O	Light	O	Light				
C-439 Forest/Snow Bare Ground	2,3 4,5	O O	Light Light	O O	Light Light				
C-440 Forest/Snow Bare Ground	4,5 2,3	O O	Moderate Moderate	⊕ O	Moderate Moderate	⊕ O	Moderate Moderate	⊕ O	Moderate Moderate
C-441** Forest/Snow Bare Ground	2,3 4,5	O O	Moderate Moderate					⊕ ⊕	Moderate Moderate
C-442** Green Fields/ Brown water	2 3 4 5	O O O O	Moderate Moderate Heavy Heavy					O O ⊕ ⊕	Moderate Moderate Heavy Heavy
C-443 Green Fields/ Brown Water	2,3 4,5	O O	Moderate Moderate	⊕ O	Moderate Moderate				
C-444 Green/Brown Fields	2,3 4,5	O O	Heavy Heavy	⊕ ⊕	Heavy Heavy	⊕ V ⊕ ⊕	Heavy Heavy		
C-445** Green/Brown Fields	2 3 4 5	O O O O	Light Light Light Light	 O O	 Light Light			⊕ ⊕	Light Light
C-446 Green/Brown Fields	2,3 4,5	O O	Moderate Moderate	O O	Moderate Moderate				

*fog in valley interpreted as ⊕ **Meteorological Description Incomplete

Table 7.2 (cont.). LOWER HEMISPHERE

Flight No. and Track	Filter No.	~300m (30-510m)		~1500m (720-2100m)		~3000m (2160-4020m)		~5700m (4230-6150m)	
		Clouds	Haze	Clouds	Haze	Clouds	Haze	Clouds	Haze
C-447** Green/Brown Fields	2	○	Moderate			◑	Light		
	3	○	Moderate			◑	Light		
	4	○	Moderate			◑	Light		
	5	○	Moderate			◑	Light		
C-448** Green/Brown Fields	2	○	Light					◍	Light
	3	○	Light					◍	Light
	4	○	Light					◑	Light
	5	○	Light					◍	Light
C-449 Green/Brown Fields/ Coastal Water	2,3	○	Light	◑	Light	○	Light	◍ V ◑	Light
	4,5	○	Light	◑	Light	◍	Light	◑	Light
C-450A** Green/Brown Fields	2,3	○	Moderate			◑	Light		
	4	○	Moderate			◑	Light		
	5	○	Moderate			◑	Light		
C-450B Green/Brown Fields	2,3	○	Moderate	◑	Light				
	4,5	○	Moderate	◑	Light				
C-451** Green/Brown Fields	2	○	Light					◑	Light
	3	○	Light					◑	Light
	4	○	Moderate					◑	Light
	5	○	Moderate					◑	Light
C-452** Green/Brown Fields	2	○	Light					◍	Light
	3	○	Light					◍	Light
	4	○	Light	○	Light				
	5	○	Light	○	Light				
C-453** Green/Brown Fields	2	○	Moderate			◍	Moderate		
	3	○	Moderate			◍	Moderate		
	4	○	Moderate			◍	Moderate		
	5	○	Moderate			◍	Moderate		
C-454 Water beneath Coast nearby	2,3	○	Heavy	○	Heavy	◑	Moderate	◑	Moderate
	4,5	○	Heavy	○	Heavy-Moderate	◑	Moderate	◑	Moderate
C-456A Water beneath Coast nearby	2,3	○	Light	○	Light				
	4,5	○	Light	○	Light				
C-456B** Water beneath/ Coast nearby	2	○	Light			◑	Light		
	3	○	Light			◑	Light		
	4	○	Light			◑	Light		
	5	○	Light			◑	Light		

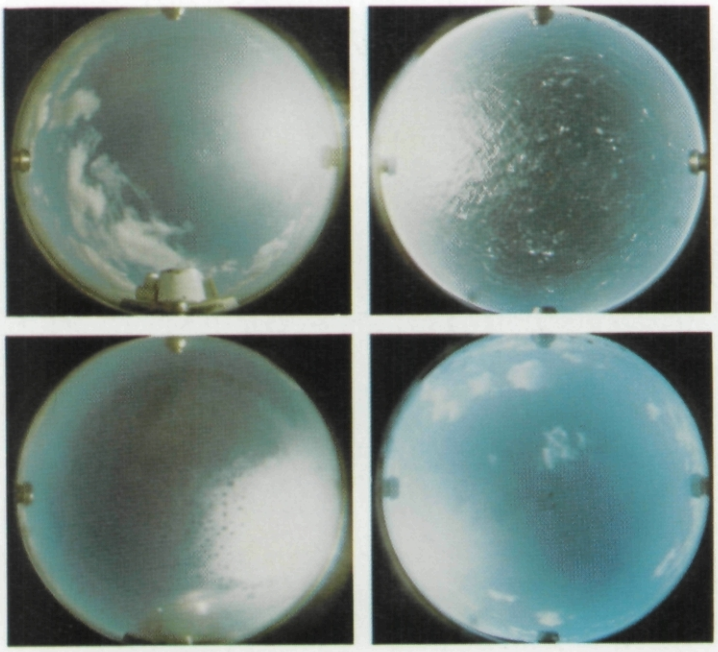
**Meteorological Description Incomplete

RADIOMETRIC DOCUMENTATION

Table 7.3 contains a summary of pertinent descriptive information on the 26 flights for which radiometric data are reported herein. The flight numbers are sequential. The times under the total time of data-taking column are Greenwich Mean Time (GMT) and Local Civil Time (LCT). The LCT is equal to GMT+1 except during the flights in England, where the two are equivalent. The sun zenith angles are tabulated for the time when data-taking began, at the time of sun transit (minimum sun zenith angle), and at the conclusion of the last data-taking. The maximum and minimum flight altitudes are noted in columns 12 and 13.

The total volume scattering coefficient, equivalent attenuation length and beam transmittance data are presented both tabularly and graphically in Section 7.3. The downwelling irradiance data are presented graphically only. All of the data are grouped into sets by flight number. A detailed description and report of the existing weather conditions are given as the introductory page to each data set.

Users should be alert to the fact that the data collected on ascents are taken in two or three segments separated in time by the straight and level flight elements. Thus the consecutive segments of these V-PROS may be separated by as much as 10 to 15 minutes in time. For more specific discusssion of these and other profile characteristics, the user is referred to Section 8.2.

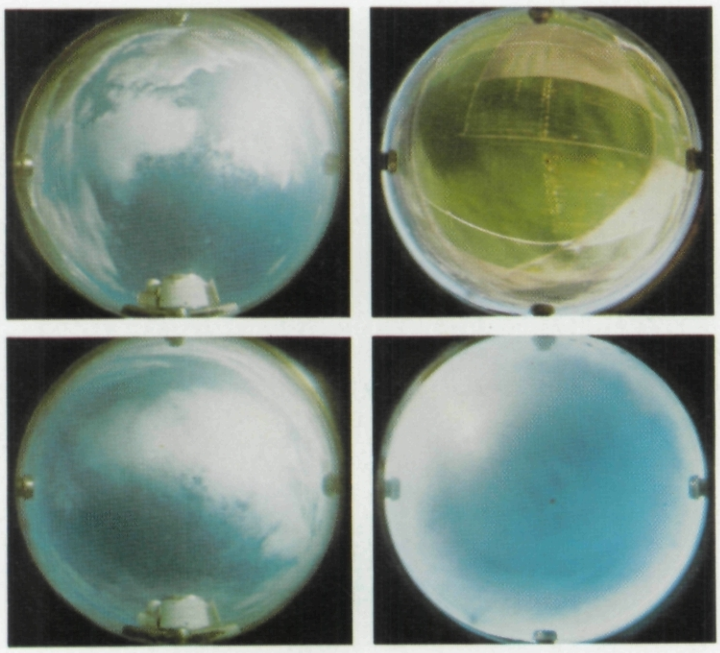


FLIGHT C-432
Trapani Track

Upper and Lower Hemisphere
120 m AGL 1324 GMT

Upper and Lower Hemisphere
3420 m AGL 1336 GMT

Fig. 7-1. Typical Sky and Terrain Photographs for Flights C-432 and C-433.



FLIGHT C-433
Sigonella Track

Upper and Lower Hemisphere
300 m AGL 1257 GMT

Upper and Lower Hemisphere
1770 m AGL 1249 GMT

FLIGHT C-437
Birkhof Track

Upper and Lower Hemisphere
450 m AGL 1144 GMT

Upper and Lower Hemisphere
4860 m AGL 1304 GMT

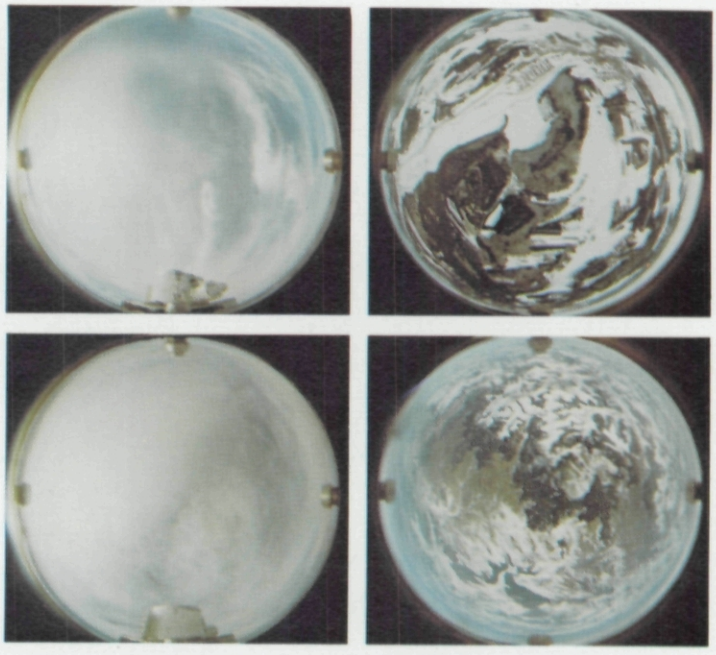


Fig. 7-2. Typical Sky and Terrain Photographs for Flights C-437 and C-440.

FLIGHT C-440
Birkhof Track

Upper and Lower Hemisphere
180 m AGL 1455 GMT

Upper and Lower Hemisphere
4114 m AGL 1427 GMT

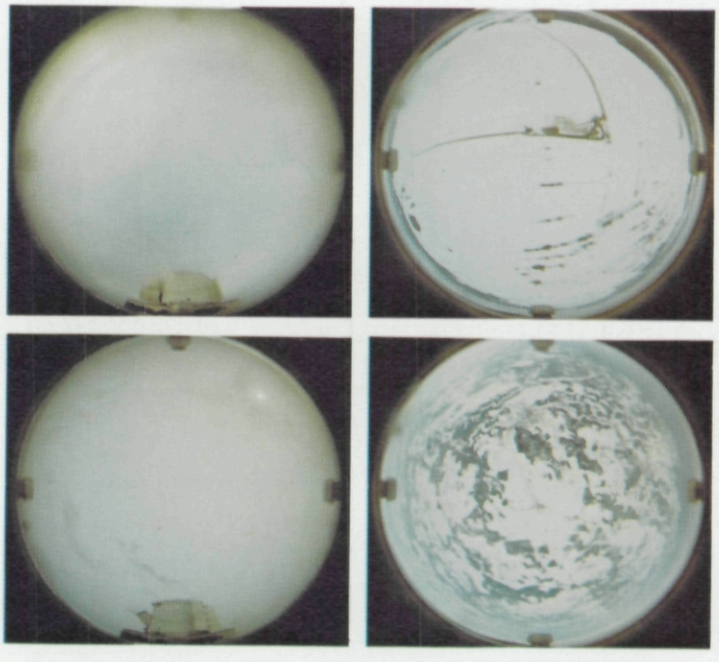


Table 7.3. Flight Data Summary, Including ST&LV and V-PRO Flight Elements, OPAQUE IV

Flight No.	Date (1978)	Total Time of Data Taking				Filter	Sun Zenith Angle (degrees)			Flight Altitude meters (AGL)	
		Start		End							
		GMT	LCT	GMT	LCT		Start	Transit	End	Min	Max
C-430	31 Jan	1449	1559	1506	1606	2	73.1	-	75.8	150	6060
		1512	1612	1531	1631	3	76.8	-	80.0	150	6030
		1536	1636	1553	1653	4	80.8	-	83.8	150	6030
		1558	1658	1614	1714	5	84.5	-	87.5	150	6030
C-431	1 Feb	1029	1129	1212	1312	2,3	56.2	54.7	55.9	90	4560
		1217	1317	1340	1440	4,5	56.1	-	63.4	120	2850
C-432	3 Feb	1229	1329	1412	1512	4,5,2,3	56.2	-	67.0	120	6060
C-433	17 Feb	1211	1311	1217	1317	2	51.2	-	51.6	150	1860
		1224	1324	1232	1332	3	52.2	-	52.9	150	1800
		1236	1336	1246	1346	4	53.1	-	54.0	150	1770
		1250	1350	1259	1359	5	54.4	-	55.4	150	1770
C-434	18 Feb	0940	1040	1126	1226	2,3	53.7	49.1	49.2	150	6120
		1132	1232	1325	1425	4,5	49.3	-	58.1	120	6150
C-435	23 Feb	0832	0932	0921	1021	2,3	71.0	-	65.2	90	2310
		0927	1027	1015	1115	4,5	64.8	-	60.9	180	2280
C-436	23 Feb	1322	1422	1403	1503	2,3	62.5	-	66.5	240	2100
		1412	1512	1452	1552	4,5	67.4	-	72.2	120	1770
C-437	27 Feb	0925	1025	1126	1226	2,3	63.6	-	56.7	150	5160
		1133	1233	1326	1426	4,5	56.6	56.6	61.6	60	5130
C-438	1 Mar	0902	1002	0926	1026	2	65.3	-	62.8	210	1650
C-439	1 Mar	1257	1357	1342	1442	2,3	58.6	-	62.3	30	1650
		1352	1452	1433	1533	4,5	63.3	-	68.0	0	1620
C-440	2 Mar	1100	1200	1252	1352	4,5	56.1	55.5	58.0	30	5340
		1259	1359	1453	1553	2,3	58.4	-	70.3	180	4350
C-441	3 Mar	1506	1606	1552	1652	2,3	71.7	-	78.4	60	5280
		1556	1656	1641	1741	4,5	79.0	-	86.1	90	5280
C-442	9 Mar	1243	1243	1301	1301	2	57.5	-	58.2	180	4650
		1303	1303	1322	1322	3	58.3	-	59.2	120	4620
		1323	1323	1346	1346	4	59.3	-	60.8	120	4710
		1347	1347	1404	1404	5	60.9	-	62.3	150	4710
C-443	9 Mar	1413	1413	1453	1453	2,3	63.1	-	67.2	150	930
		1459	1459	1537	1537	4,5	67.9	-	72.5	150	930
C-444	11 Mar	1259	1259	1411	1411	2,3	55.3	-	59.6	120	2190
		1415	1415	1521	1521	4,5	60.0	-	66.9	120	2460
C-445	13 Mar	1115	1215	1134	1234	2	55.3	-	55.0	90	4560
		1136	1236	1153	1253	3	54.9	54.9	54.9	90	4620
		1152	1252	1206	1306	4	54.9	-	55.0	90	1200
		1207	1307	1215	1315	5	55.0	-	55.2	90	1200
C-446	15 Mar	1116	1116	1158	1158	2,3	54.8	-	53.3	90	870
		1204	1204	1238	1238	4,5	53.2	53.1	53.3	150	810
C-447	15 Mar	1247	1247	1303	1303	2	53.4	-	53.9	90	3570
		1305	1305	1342	1342	3	54.0	-	56.0	90	3510
		1344	1344	1401	1401	4	56.1	-	57.4	150	3510
		1402	1402	1415	1415	5	57.5	-	58.6	120	3510
C-448	17 Mar	1118	1118	1146	1146	2	53.9	-	52.8	90	5970
		1147	1147	1212	1212	3	52.7	-	52.3	90	5970
		1211	1211	1238	1238	4	52.3	52.3	52.5	60	6000
		1240	1240	1259	1259	5	52.5	-	53.0	30	5970
C-449	18 Mar	0945	0945	1122	1122	2,3	61.3	-	53.2	150	4590
		1126	1126	1316	1316	4,5	53.1	51.9	53.4	150	6180
C-450A	22 Mar	0945	1045	1020	1120	2,3	57.2	-	54.4	90	4020
		1023	1123	1040	1140	4	54.1	-	53.1	120	3990
		1042	1142	1056	1156	5	53.0	-	52.4	120	4020
C-450B	22 Mar	1100	1200	1136	1236	2,3	52.2	-	51.4	180	1080
		1140	1240	1227	1327	4,5	51.3	51.3	52.1	120	1140
C-451	22 Mar	1308	1408	1325	1425	2	55.7	-	57.0	120	4560
		1327	1427	1344	1444	3	57.2	-	58.7	180	4560
		1343	1443	1401	1501	4	58.6	-	60.3	150	4590
		1402	1502	1418	1518	5	60.4	-	62.1	90	4590
C-452	23 Mar	1429	1529	1452	1552	2	63.0	-	65.8	150	5220
		1453	1553	1518	1618	3	66.0	-	69.1	120	5220
		1516	1616	1528	1628	4	68.9	-	70.5	150	1140
		1530	1630	1540	1640	5	70.7	-	72.1	120	1020
C-453	28 Mar	0841	0941	0856	0956	2	61.5	-	59.8	120	3060
		0858	0958	0916	1016	3	59.6	-	57.6	60	3060
		0918	1018	0931	1031	4	57.5	-	56.2	120	3030
		0933	1033	0952	1052	5	56.0	-	54.4	120	3030

Table 7.3. (cont.). Flight Data Summary, Including ST&LV and V-PRO Flight Elements, OPAQUE IV

Flight No.	Date (1978)	Total Time of Data Taking				Filter	Sun Zenith Angle (degrees)			Flight Altitude meters (AGL)	
		Start		End							
		GMT	LCT	GMT	LCT		Start	Transit	End	Min	Max
C-454	28 Mar	1046	1146	1213	1313	2,3	52.2	51.7	52.8	150	4230
		1217	1317	1346	1446	4,5	53.0	-	59.5	120	4260
C-456A	31 Mar	1303	1403	1340	1440	2,3	54.7	-	58.0	120	1200
		1344	1444	1416	1516	4,5	58.3	-	61.8	120	780
C-456B	31 Mar	1429	1529	1444	1544	2	63.2	-	65.0	30	3660
		1445	1545	1501	1601	3	65.2	-	67.2	120	3660
		1503	1603	1519	1619	4	67.4	-	69.5	120	3630
		1520	1620	1534	1634	5	69.7	-	71.6	120	3630

7.2. DESCRIPTION OF AIRBORNE DATA TABLES AND GRAPHS

DATA TABLES

Data are presented in tables of:

Total Volume Scattering Coefficient
Equivalent Attenuation Length
Beam Transmittance Between Ground and Altitude

Each optical property is tabulated in the tables as a function of altitude above ground level. the data are further divided by optical filters which are given in order of increasing wavelength.

The tables have been divided into two categories depending upon the meaning of the altitude in the tables, (1) the variable tabulated by measurement altitude: total volume scattering coefficient, and (2) the variables tabulated by object or sensor altitude depending on whether the path of sight is upward or downward: equivalent attenuation length, and beam transmittance.

CATEGORY I: MEASUREMENT ALTITUDE

Total Volume Scattering Coefficient. The total volume scattering coefficient $s(z)$ is tabulated by measurement altitude in one to four columns for the optical filters. The altitude is given in meters, above ground level, at 30 meter (98.4-foot) increments. The measurement unit for the total scattering coefficient is m^{-1}. The extrapolated points above or below the actual altitudes of measurement are indicated by parentheses.

The first and last data altitudes are given at the bottom of the total scattering coefficient table. These are the lowest and highest altitudes of airborne data measurements.

The total scattering coefficient is used for the calculation of atmospheric beam transmittance and equivalent attenuation length in the ensuing tables using the equations of the Theory, Section 2.

CATEGORY II: OBJECT OR SENSOR ALTITUDE

These variables are tabulated by object or sensor altitude depending upon whether the path of sight is upward or downward. For upward paths of sight $\theta < 90°$ the sensor is at ground level and the altitudes shown in the table are the object altitudes. For the downward paths of sight $\theta > 90°$, the object is at ground level and the altitudes in the table are the sensor altitudes.

Equivalent Attenuation Length. The equivalent attenuation length $\bar{L}(z)$ is a pseudo-attenuation length which, when combined with its altitude z, can be used directly in Eq. (2.6) to compute beam transmittance. The equivalent attenuation length permits easy calculation of the atmospheric beam transmittance between ground level and altitude z above ground level for any downward path of sight from 95 degrees to 180 degrees in zenith angle or between altitude and ground level for any upward path of sight from 0 degrees to 85 degrees in zenith angle.

The equivalent attenuation length $\bar{L}(z)$ is tabulated by altitude for the path of sight between ground and the altitude shown in one to four columns for the optical filters. The altitude is given in meters, above ground level, at 300-meter (984-foot) increments. The unit for the equivalent attenuation length is "m."

Beam Transmittance Between Ground and Altitude. The atmospheric beam transmittance is tabulated for the vertically upward path of sight $T_z(0, 0°)$ or the vertically downward path of sight $T_z(z, 180°)$ for the path of sight between ground and the altitude shown. The beam transmittance is computed from measurements of total scattering coefficient. The assumption is made that there is no significant atmospheric absorption in the pass bands of the measurements, whence the atmospheric attenuation coefficient $\alpha(z)$ is assumed equivalent to the scattering coefficient $s(z)$.

The vertical beam transmittance is tabulated by altitude for the path of sight between ground and the altitude shown in one to four columns for the optical filters. The altitude is given in meters, above ground level, at 300-meter (984-foot) increments. This property is dimensionless.

DATA GRAPHS

Data are also presented in graphs of:

Total Volume Scattering Coefficient

Equivalent Attenuation Length, Between Ground and Altitude

Vertical Beam Transmittance, Between Ground and Altitude

Downwelling Irradiance

Total Volume Scattering Coefficient. The total volume scattering coefficient $s(z)$ in m^{-1} is graphed using a single average value for each 30-meter altitude interval. Identifying symbols for the spectral filters appear every fifth data point, or at 150-meter intervals. These same data were tabulated in the total scattering coefficient table. The extrapolated values are indicated by a dashed line.

Equivalent Attenuation Length. The equivalent attenuation length $\bar{L}(z)$ in meters, for the path between ground and altitude, is graphed for each 30-meter altitude interval. This represents smaller altitude increments than in the tabular display of equivalent attenuation length. Spectral identifying symbols appear at 150-meter intervals or every fifth data point.

Vertical Beam Transmittance Between Ground and Altitude. The vertical beam transmittance $T_r(0,0°)$ or $T_r(z,180°)$ between ground and altitude is graphed for each 30-meter altitude interval. This represents smaller altitude increments than in the tabular display of beam transmittance. Spectral identifying symbols appear at 150-meter intervals or every fifth data point.

Downwelling Irradiance. The downwelling irradiance $H(z,d)$ is graphed as a function of altitude above ground level (AGL). These irradiances were measured by the dual irradiometer concurrently with the total volume scattering coefficient measurements. The downwelling irradiance during the ascent or descent is graphed using a single average value for each 30-meter altitude interval and the identifying symbol for the spectral filter appears every fifth data point; thus when data are continuous the symbols appear at 150-meter intervals. The second symbol for each filter designates the average value measured during each three-minute straight and level flight element.

7.3. PRESENTATION OF AIRBORNE DATA

Tabular listings and graphical displays of the data discussed in Section 7.2 are presented in the pages immediately following. *Users should be aware that regardless of the display format, the data values are valid to, at best, only three significant figures. The tables of beam transmittance, in particular, should be rounded off to 2 digits prior to further application.*

It should also be remembered that all values in the data tables except scattering coefficient are computed values based upon the measured values of scattering coefficient.

All altitudes presented in the data tables, in the flight description, and in the graphs are given as above ground level (AGL) unless otherwise specified.

FLIGHT C-430 - 31 JANUARY 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2	1449	1506	0.28	73.1	-	75.8	6060	Sea Level
3	1512	1531	0.32	76.8	-	80.0	6030	Sea Level
4	1536	1553	0.28	80.8	-	83.8	6030	Sea Level
5	1558	1614	0.27	84.5	-	87.5	6030	Sea Level

Flight Description. Flight C-430 was an afternoon flight with take off at 1346 GMT and landing at 1707 GMT. Scattered low clouds. The approximate northwest to southeast Trapani track was located west of Sicily. The flight consisted of V-PRO'S over shallow water in the Strait of Sicily. Typical terrain features along the nearby coast east of the track were brown and green rolling fields.

In-Flight Notes. The in-flight observer reported moderate haze with scattered imbedded cumulus at 1445 GMT. There was also weather layering from 2700 to 3400 meters (9000 to 11,000 feet). From above it appeared that the top of the haze layer was thicker. At 1500 GMT the haze character was unchanged. There were stratus and fractocumulus 900 to 600 meters (3000 to 2000 feet) on descent. At 1535 GMT cumulus bases were 600 meters (2000 feet) with tops 1800 meters (6000 feet). The heaviest haze layer top appeared to be from 2400 to 2700 meters (8000 to 9000 feet) with thinner and layered haze above. Maximum tops seemed to vary with higher tops to the west. Tops of a thin haze layer were at 6100 meters (20,000 feet which was also the tops of the clouds. Cumulonimbus were observed 48 kilometers (30 miles) out from the track. No slant range visibilities were reported.

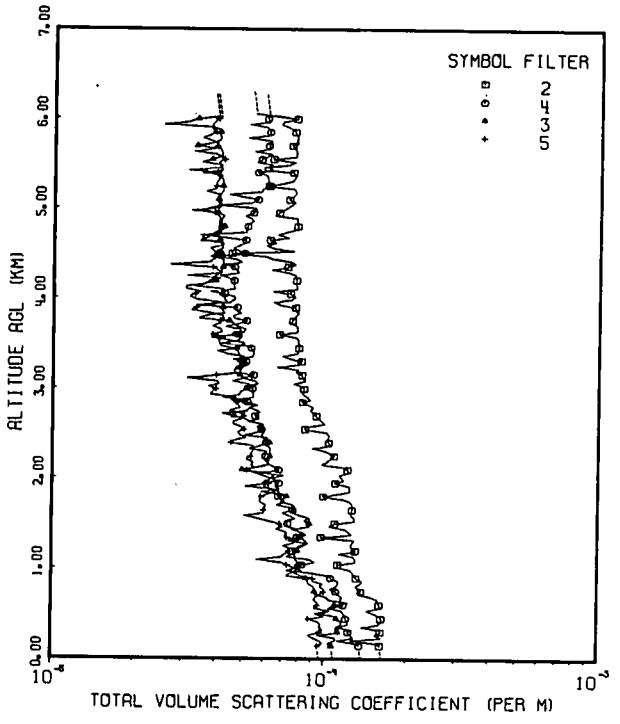
Local Weather Notes. Trapani, 41 kilometers northeast of the track center, reported 2/8 to 3/8 cumulus and cumulonimbus clouds at 750 meters (2500 feet) with visibility 11.2 kilometers. A thundershower was reported at 1320 GMT shortly before data taking commenced.

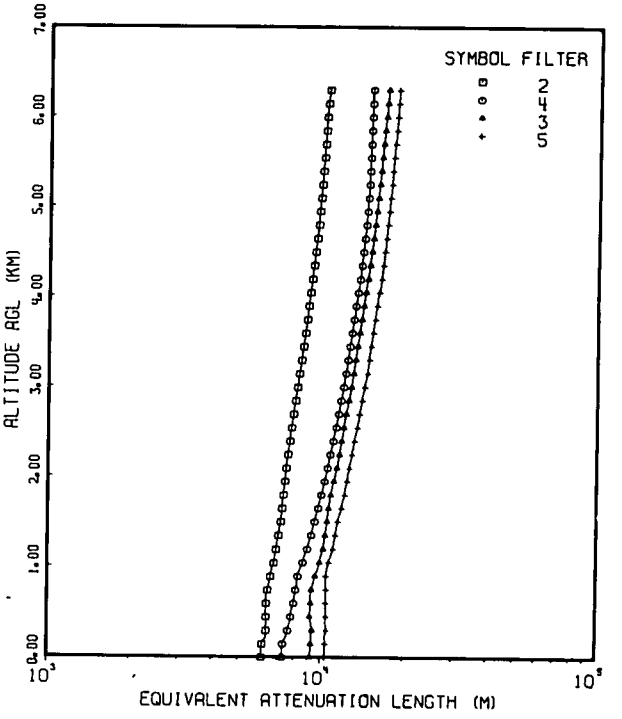
Pantelleria, an island 94 kilometers southwest of the track, reported 3/8 cumulus and cumulonimbus at 600 to 750 meters (2000 to 2500 feet) and 5/8 to 6/8 altostratus at 2400 meters (8000 feet). Visibility was recorded as 11.2 kilometers with light rain after 1500 GMT.

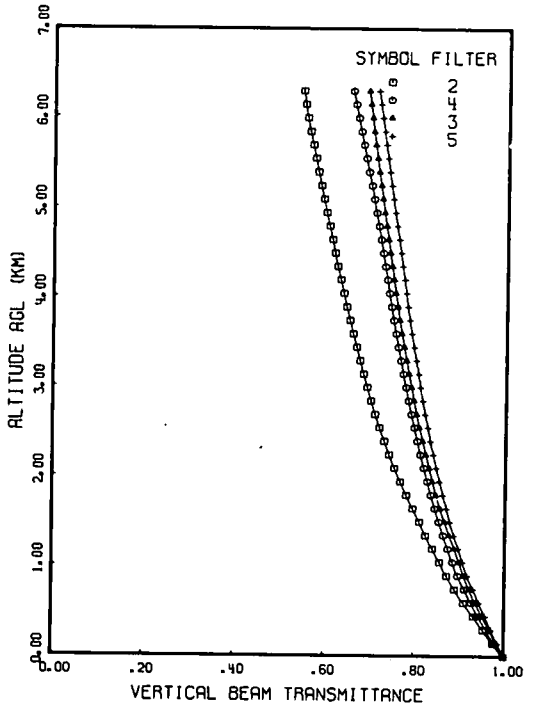
The radiosonde station at Trapani was northeast and downstream over land from the track which was over the water. The vertical cross section at 1200 GMT showed 2/8 clouds about 700 meters, 5/8 cloud at 1200 meters and no clouds above 1500 meters. Since the in-flight observer reported cloud tops at 1800 meters at 1535 GMT this indicates the cumulus were building over the track after noon.

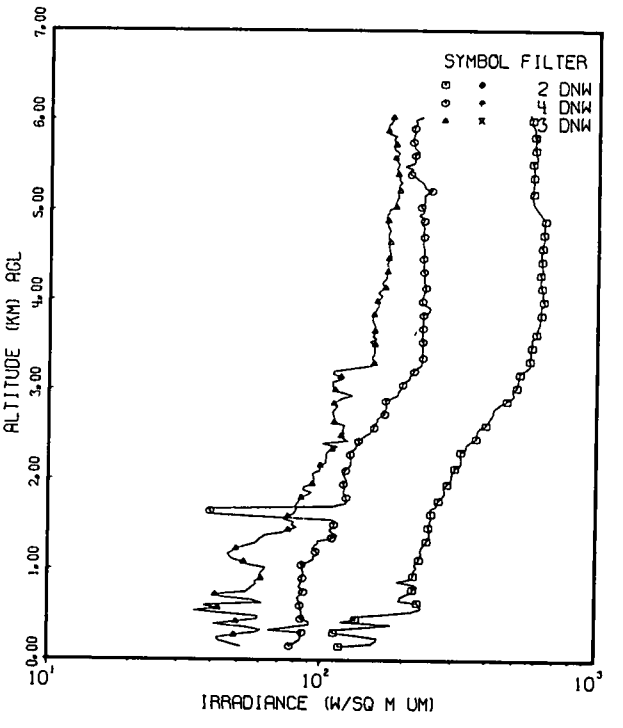
Synoptic Remarks. The surface charts show a 990 millibars low off Scotland with an occlusion south to Edinburgh, then a warm front southerly through Cardiff to near Madrid. There was a 1005 millibars low near Naples with west and northwest surface flow over the track located south of the low center. At 500 millibars there was a low centered in the northern Adriatic with a cold trough through Sicily to Libya. The upper flow was westerly over Sicily and the air mass was unstable maritime polar.

FLIGHT NO. C-430
TRAPANI









FLIGHT NO. C-430
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5109 DATE 03/29/79)
DATE 13178 FLIGHT NO. C-430 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(1.64E-04)	(1.38E-04)	(1.09E-04)	(9.67E-05)
30	(1.63E-04)	(1.37E-04)	(1.08E-04)	(9.62E-05)
60	(1.62E-04)	(1.37E-04)	(1.08E-04)	(9.59E-05)
90	(1.62E-04)	(1.36E-04)	(1.08E-04)	(9.57E-05)
120	(1.62E-04)	(1.36E-04)	(1.07E-04)	(9.55E-05)
150	1.61E-04	1.35E-04	1.07E-04	9.52E-05
180	1.56E-04	1.31E-04	1.03E-04	9.91E-05
210	1.26E-04	1.13E-04	1.10E-04	9.65E-05
240	1.63E-04	1.29E-04	1.10E-04	9.13E-05
270	1.54E-04	1.26E-04	9.52E-05	8.77E-05
300	1.61E-04	1.23E-04	1.13E-04	9.64E-05
330	1.61E-04	1.28E-04	1.10E-04	9.93E-05
360	1.37E-04	1.11E-04	1.13E-04	9.62E-05
390	1.59E-04	1.23E-04	1.16E-04	9.81E-05
420	1.64E-04	1.22E-04	1.16E-04	9.44E-05
450	1.62E-04	1.21E-04	1.11E-04	8.79E-05
480	1.61E-04	1.21E-04	1.11E-04	1.00E-04
510	1.53E-04	1.18E-04	9.73E-05	9.27E-05
540	1.43E-04	1.16E-04	1.05E-04	1.05E-04
570	1.61E-04	1.04E-04	1.05E-04	9.23E-05
600	1.60E-04	1.18E-04	1.10E-04	9.46E-05
630	1.58E-04	1.15E-04	1.23E-04	9.48E-05
660	1.57E-04	1.16E-04	1.04E-04	9.21E-05
690	1.48E-04	1.17E-04	1.02E-04	9.35E-05
720	1.33E-04	1.13E-04	9.32E-05	9.62E-05
750	1.37E-04	1.11E-04	9.25E-05	9.98E-05
780	1.34E-04	1.05E-04	9.19E-05	9.99E-05
810	1.31E-04	1.11E-04	9.14E-05	9.66E-05
840	1.36E-04	1.13E-04	8.77E-05	9.91E-05
870	1.38E-04	1.13E-04	8.73E-05	9.07E-05
900	1.31E-04	1.06E-04	8.58E-05	9.11E-05
930	1.30E-04	1.04E-04	7.26E-05	8.23E-05
960	1.27E-04	9.00E-05	7.57E-05	7.77E-05
990	1.25E-04	7.25E-05	7.89E-05	8.27E-05
1020	1.13E-04	8.05E-05	7.95E-05	7.68E-05
1050	1.12E-04	8.28E-05	8.02E-05	7.31E-05
1080	1.30E-04	9.27E-05	8.03E-05	6.90E-05
1110	1.30E-04	8.77E-05	7.84E-05	5.64E-05
1140	1.28E-04	7.28E-05	7.82E-05	6.96E-05
1170	1.13E-04	7.74E-05	7.75E-05	7.19E-05
1200	1.30E-04	7.67E-05	7.98E-05	7.38E-05
1230	1.27E-04	7.88E-05	7.99E-05	7.49E-05
1260	1.25E-04	8.14E-05	8.35E-05	7.06E-05
1290	1.27E-04	8.69E-05	8.72E-05	7.71E-05
1320	1.29E-04	7.38E-05	8.44E-05	7.90E-05
1350	9.71E-05	7.94E-05	8.16E-05	7.29E-05
1380	1.26E-04	8.48E-05	8.60E-05	7.14E-05
1410	1.22E-04	8.07E-05	8.16E-05	7.31E-05
1440	1.18E-04	8.00E-05	7.60E-05	6.64E-05
1470	1.04E-04	7.30E-05	8.78E-05	6.99E-05
1500	1.09E-04	7.33E-05	8.82E-05	6.83E-05

FLIGHT NO. C-430
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 2109 DATE 03/29/79)
DATE 13178 FLIGHT NO. C-430 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	1.29E-04	7.17E-05	8.40E-05	6.19E-05
1560	1.29E-04	7.82E-05	8.84E-05	5.63E-05
1590	1.25E-04	7.40E-05	8.09E-05	5.06E-05
1620	1.26E-04	6.99E-05	7.58E-05	5.97E-05
1650	1.26E-04	7.64E-05	7.69E-05	5.96E-05
1680	1.28E-04	7.62E-05	7.81E-05	6.04E-05
1710	1.26E-04	6.64E-05	7.65E-05	6.06E-05
1740	1.24E-04	7.13E-05	6.89E-05	5.78E-05
1770	1.17E-04	6.95E-05	7.08E-05	5.80E-05
1800	9.86E-05	6.75E-05	7.26E-05	5.83E-05
1830	1.11E-04	7.11E-05	6.80E-05	6.18E-05
1860	1.24E-04	5.84E-05	6.81E-05	6.55E-05
1890	1.23E-04	6.82E-05	6.40E-05	6.33E-05
1920	1.23E-04	6.55E-05	5.12E-05	5.96E-05
1950	1.09E-04	6.78E-05	6.04E-05	6.20E-05
1980	1.17E-04	6.54E-05	6.19E-05	6.59E-05
2010	1.15E-04	6.48E-05	6.35E-05	6.30E-05
2040	1.13E-04	7.04E-05	6.51E-05	5.88E-05
2070	1.22E-04	5.82E-05	6.18E-05	5.48E-05
2100	1.21E-04	6.76E-05	4.96E-05	5.18E-05
2130	1.18E-04	6.55E-05	5.57E-05	5.48E-05
2160	9.72E-05	6.23E-05	6.18E-05	5.35E-05
2190	1.02E-04	6.14E-05	6.19E-05	5.45E-05
2220	1.05E-04	5.98E-05	6.23E-05	5.12E-05
2250	1.08E-04	6.03E-05	6.27E-05	5.32E-05
2280	1.05E-04	6.08E-05	6.26E-05	5.36E-05
2310	9.96E-05	6.09E-05	6.24E-05	5.40E-05
2340	8.96E-05	5.26E-05	6.31E-05	5.47E-05
2370	1.05E-04	5.81E-05	6.06E-05	5.41E-05
2400	1.03E-04	6.07E-05	6.25E-05	4.49E-05
2430	1.02E-04	5.98E-05	6.20E-05	4.63E-05
2460	1.03E-04	6.16E-05	5.84E-05	5.10E-05
2490	1.03E-04	5.05E-05	5.87E-05	4.84E-05
2520	1.01E-04	5.65E-05	5.97E-05	4.77E-05
2550	8.41E-05	5.83E-05	5.81E-05	5.01E-05
2580	8.57E-05	5.59E-05	5.85E-05	4.88E-05
2610	9.93E-05	5.90E-05	5.93E-05	4.59E-05
2640	9.70E-05	5.22E-05	5.30E-05	4.61E-05
2670	9.47E-05	5.69E-05	5.07E-05	4.91E-05
2700	9.24E-05	5.52E-05	4.63E-05	5.01E-05
2730	9.01E-05	5.82E-05	4.18E-05	4.87E-05
2760	8.77E-05	5.59E-05	5.15E-05	4.43E-05
2790	9.04E-05	5.24E-05	5.29E-05	4.84E-05
2820	8.63E-05	5.63E-05	5.43E-05	4.76E-05
2850	8.23E-05	5.17E-05	5.09E-05	4.68E-05
2880	8.81E-05	4.50E-05	4.95E-05	4.71E-05
2910	8.51E-05	5.43E-05	4.21E-05	4.62E-05
2940	8.25E-05	5.41E-05	4.83E-05	3.77E-05
2970	8.33E-05	5.40E-05	4.88E-05	3.86E-05
3000	8.32E-05	5.38E-05	5.11E-05	3.93E-05

FLIGHT NO. C-430
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5109 DATE 03/29/79)
DATE 13178 FLIGHT NO. C-430 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	8.22E-05	5.01E-05	5.33E-05	3.71E-05
3060	7.59E-05	5.64E-05	5.21E-05	4.03E-05
3090	8.43E-05	5.47E-05	4.53E-05	3.98E-05
3120	8.21E-05	4.90E-05	5.03E-05	3.09E-05
3150	8.17E-05	5.42E-05	4.83E-05	3.94E-05
3180	7.73E-05	4.63E-05	4.85E-05	4.81E-05
3210	7.94E-05	4.58E-05	4.86E-05	4.87E-05
3240	6.61E-05	4.95E-05	4.64E-05	4.92E-05
3270	7.91E-05	5.19E-05	5.06E-05	4.91E-05
3300	8.11E-05	5.09E-05	4.97E-05	4.84E-05
3330	7.39E-05	4.55E-05	4.87E-05	4.95E-05
3360	6.89E-05	5.38E-05	4.82E-05	4.98E-05
3390	7.83E-05	5.45E-05	4.76E-05	4.31E-05
3420	7.92E-05	5.38E-05	4.72E-05	3.98E-05
3450	7.94E-05	5.31E-05	4.68E-05	4.64E-05
3480	8.02E-05	5.11E-05	4.85E-05	4.08E-05
3510	7.87E-05	4.11E-05	5.02E-05	4.04E-05
3540	7.92E-05	4.76E-05	4.43E-05	4.00E-05
3570	7.71E-05	4.90E-05	3.77E-05	4.24E-05
3600	6.72E-05	4.74E-05	4.58E-05	3.84E-05
3630	7.82E-05	4.89E-05	4.97E-05	4.15E-05
3660	7.81E-05	4.82E-05	5.07E-05	4.07E-05
3690	7.81E-05	4.25E-05	4.70E-05	3.81E-05
3720	7.45E-05	4.74E-05	4.55E-05	4.03E-05
3750	7.51E-05	5.09E-05	4.39E-05	4.06E-05
3780	7.62E-05	4.57E-05	3.40E-05	4.19E-05
3810	7.74E-05	4.57E-05	3.61E-05	4.12E-05
3840	7.91E-05	4.86E-05	4.21E-05	3.73E-05
3870	7.68E-05	4.62E-05	4.13E-05	3.19E-05
3900	7.68E-05	4.69E-05	4.15E-05	3.32E-05
3930	6.72E-05	3.32E-05	3.61E-05	3.46E-05
3960	6.38E-05	4.43E-05	4.29E-05	4.07E-05
3990	7.47E-05	4.61E-05	4.21E-05	3.32E-05
4020	7.68E-05	4.57E-05	4.19E-05	3.13E-05
4050	7.35E-05	4.22E-05	4.13E-05	3.28E-05
4080	6.34E-05	3.73E-05	4.17E-05	3.43E-05
4110	7.78E-05	4.60E-05	4.15E-05	3.03E-05
4140	7.73E-05	4.56E-05	3.27E-05	3.05E-05
4170	7.71E-05	4.56E-05	3.59E-05	3.55E-05
4200	7.73E-05	4.57E-05	3.90E-05	3.78E-05
4230	7.71E-05	4.36E-05	4.05E-05	3.80E-05
4260	7.66E-05	4.07E-05	3.07E-05	3.92E-05
4290	7.21E-05	4.76E-05	4.09E-05	4.08E-05
4320	6.27E-05	4.66E-05	4.11E-05	3.95E-05
4350	7.18E-05	4.58E-05	4.14E-05	3.82E-05
4380	7.67E-05	4.21E-05	4.13E-05	2.66E-05
4410	7.34E-05	4.87E-05	4.17E-05	3.73E-05
4440	6.30E-05	4.63E-05	4.13E-05	3.85E-05
4470	5.85E-05	3.90E-05	3.71E-05	3.99E-05
4500	4.46E-05	4.98E-05	4.09E-05	3.93E-05

FLIGHT NO. C-430
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5109 DATE 03/29/79)
DATE 13178 FLIGHT NO. C-430 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M)			
	FILTERS 2	4	3	5
4530	7.55E-05	4.74E-05	3.93E-05	3.81E-05
4560	6.37E-05	4.51E-05	4.12E-05	3.70E-05
4590	5.96E-05	4.75E-05	4.13E-05	4.08E-05
4620	6.50E-05	5.00E-05	4.15E-05	4.07E-05
4650	6.15E-05	5.02E-05	3.50E-05	4.02E-05
4680	7.22E-05	4.22E-05	3.63E-05	4.08E-05
4710	6.54E-05	3.42E-05	3.76E-05	3.87E-05
4740	7.10E-05	5.05E-05	3.89E-05	4.06E-05
4770	7.76E-05	5.05E-05	4.11E-05	3.95E-05
4800	7.76E-05	5.10E-05	4.19E-05	4.05E-05
4830	7.76E-05	5.16E-05	4.06E-05	3.98E-05
4860	7.76E-05	5.34E-05	4.08E-05	4.01E-05
4890	7.76E-05	5.24E-05	4.10E-05	4.05E-05
4920	6.38E-05	4.97E-05	4.19E-05	3.95E-05
4950	6.63E-05	5.35E-05	3.95E-05	3.86E-05
4980	6.87E-05	5.51E-05	3.49E-05	3.17E-05
5010	7.12E-05	5.42E-05	3.72E-05	3.99E-05
5040	7.36E-05	4.02E-05	4.05E-05	4.03E-05
5070	7.60E-05	5.29E-05	4.01E-05	3.95E-05
5100	7.22E-05	5.56E-05	3.95E-05	3.96E-05
5130	7.42E-05	4.95E-05	4.00E-05	3.98E-05
5160	7.62E-05	4.33E-05	4.04E-05	4.00E-05
5190	7.61E-05	5.70E-05	4.10E-05	3.56E-05
5220	7.51E-05	5.80E-05	4.11E-05	3.86E-05
5250	6.06E-05	6.17E-05	4.11E-05	3.88E-05
5280	6.74E-05	6.10E-05	4.10E-05	3.90E-05
5310	7.43E-05	6.02E-05	4.11E-05	3.93E-05
5340	7.55E-05	6.01E-05	4.06E-05	4.02E-05
5370	7.62E-05	5.96E-05	4.05E-05	3.92E-05
5400	7.45E-05	5.53E-05	3.54E-05	3.92E-05
5430	5.82E-05	6.27E-05	4.07E-05	3.08E-05
5460	5.81E-05	6.00E-05	4.04E-05	4.02E-05
5490	7.19E-05	6.23E-05	4.07E-05	4.01E-05
5520	7.58E-05	5.47E-05	3.44E-05	3.97E-05
5550	6.28E-05	5.71E-05	3.73E-05	4.16E-05
5580	7.61E-05	5.95E-05	4.03E-05	4.01E-05
5610	7.64E-05	6.19E-05	4.08E-05	3.86E-05
5640	7.61E-05	5.36E-05	4.04E-05	3.22E-05
5670	7.54E-05	6.15E-05	4.01E-05	3.78E-05
5700	7.37E-05	6.07E-05	3.30E-05	3.90E-05
5730	7.73E-05	6.20E-05	3.73E-05	3.89E-05
5760	7.61E-05	6.16E-05	3.98E-05	3.71E-05
5790	7.73E-05	5.08E-05	4.03E-05	3.44E-05
5820	7.58E-05	6.09E-05	3.98E-05	3.69E-05
5850	7.55E-05	6.12E-05	4.01E-05	3.85E-05
5880	7.43E-05	6.11E-05	4.03E-05	3.74E-05
5910	7.07E-05	5.91E-05	3.69E-05	3.77E-05
5940	6.71E-05	5.13E-05	2.51E-05	3.77E-05
5970	6.85E-05	6.11E-05	3.08E-05	3.86E-05
6000	7.67E-05	6.00E-05	3.33E-05	3.95E-05

FLIGHT NO. C-430
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5109 DATE 03/29/79)
DATE 13178 FLIGHT NO. C-430 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
6030	6.65E-05	6.06E-05	3.97E-05	4.05E-05
6060	5.43E-05	(6.04E-05)	(3.96E-05)	(4.03E-05)
6090	(5.41E-05)	(6.02E-05)	(3.94E-05)	(4.02E-05)
6120	(5.39E-05)	(6.00E-05)	(3.93E-05)	(4.01E-05)
6150	(5.38E-05)	(5.98E-05)	(3.92E-05)	(4.00E-05)
6180	(5.36E-05)	(5.96E-05)	(3.90E-05)	(3.98E-05)
6210	(5.34E-05)	(5.94E-05)	(3.89E-05)	(3.97E-05)
6240	(5.32E-05)	(5.92E-05)	(3.88E-05)	(3.96E-05)
6270	(5.31E-05)	(5.91E-05)	(3.87E-05)	(3.94E-05)
6300	(5.29E-05)	(5.89E-05)	(3.85E-05)	(3.93E-05)
FIRST DATA ALT	150	150	150	150
LAST DATA ALT	6060	6030	6030	6030

FLIGHT NO. C-430
EQUIVALENT ATTENUATION LENGTH

(JOB 5109 DATE 03/29/79)
DATE 13178 FLIGHT NO. C-430 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(6.11E 03)	(7.27E 03)	(9.19E 03)	(1.03E 04)
300	6.37E 03	7.64E 03	9.36E 03	1.05E 04
600	6.39E 03	8.02E 03	9.24E 03	1.05E 04
900	6.59E 03	8.29E 03	9.57E 03	1.05E 04
1200	6.91E 03	8.95E 03	1.02E 04	1.11E 04
1500	7.16E 03	9.50E 03	1.05E 04	1.15E 04
1800	7.30E 03	1.00E 04	1.08E 04	1.22E 04
2100	7.46E 03	1.05E 04	1.14E 04	1.27E 04
2400	7.67E 03	1.10E 04	1.18E 04	1.32E 04
2700	7.90E 03	1.15E 04	1.23E 04	1.38E 04
3000	8.16E 03	1.20E 04	1.28E 04	1.43E 04
3300	8.43E 03	1.24E 04	1.32E 04	1.48E 04
3600	8.69E 03	1.28E 04	1.37E 04	1.53E 04
3900	8.92E 03	1.32E 04	1.41E 04	1.58E 04
4200	9.15E 03	1.36E 04	1.46E 04	1.63E 04
4500	9.37E 03	1.40E 04	1.50E 04	1.67E 04
4800	9.60E 03	1.43E 04	1.54E 04	1.71E 04
5100	9.77E 03	1.45E 04	1.57E 04	1.74E 04
5400	9.93E 03	1.47E 04	1.61E 04	1.78E 04
5700	1.01E 04	1.48E 04	1.64E 04	1.81E 04
6000	1.02E 04	1.49E 04	1.67E 04	1.84E 04
6300	(1.04E 04)	(1.50E 04)	(1.70E 04)	(1.86E 04)

FLIGHT NO. C-430
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

$T_{e1} = 0.0900$

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.54E-01	9.62E-01	9.68E-01	9.72E-01
600	9.10E-01	9.28E-01	9.37E-01	9.44E-01
900	8.72E-01	8.97E-01	9.10E-01	9.18E-01
1200	8.41E-01	8.75E-01	8.89E-01	8.97E-01
1500	8.11E-01	8.54E-01	8.67E-01	8.78E-01
1800	7.82E-01	8.36E-01	8.47E-01	8.63E-01
2100	7.55E-01	8.19E-01	8.31E-01	8.47E-01
2400	7.31E-01	8.04E-01	8.16E-01	8.34E-01
2700	7.11E-01	7.91E-01	8.02E-01	8.22E-01
3000	6.92E-01	7.78E-01	7.91E-01	8.11E-01
3300	6.76E-01	7.66E-01	7.79E-01	8.00E-01
3600	6.61E-01	7.55E-01	7.68E-01	7.90E-01
3900	6.46E-01	7.44E-01	7.58E-01	7.81E-01
4200	6.32E-01	7.35E-01	7.49E-01	7.73E-01
4500	6.19E-01	7.25E-01	7.40E-01	7.64E-01
4800	6.06E-01	7.15E-01	7.32E-01	7.55E-01
5100	5.93E-01	7.04E-01	7.23E-01	7.46E-01
5400	5.80E-01	6.92E-01	7.14E-01	7.38E-01
5700	5.68E-01	6.80E-01	7.06E-01	7.29E-01
6000	5.56E-01	6.68E-01	6.98E-01	7.21E-01
6300	(5.47E-01)	(6.56E-01)	(6.90E-01)	(7.13E-01)

FLIGHT C-431 - 1 FEBRUARY 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	1029	1212	1.72	56.2	54.7	55.9	4560	Sea Level
4,5	1217	1340	1.38	56.1	-	63.4	2850	Sea Level

Flight Description. Flight C-431 was a midday flight spanning local apparent noon. The take off was at 0945 GMT and the landing at 1435 GMT. Scattered low clouds and scattered to broken high thin clouds were present during the morning. Scattered middle clouds began by noon, and increased to overcast by mid afternoon. The approximate northwest to southeast Trapani track was located west of Sicily. Typical terrain features along the nearby coast were brown and green rolling fields. Directly below the track were the relatively shallow waters of the Strait of Sicily. The track was moved 24 kilometers (15 miles) to the southeast about 1215 GMT.

In-Flight Notes. The in-flight observer reported thin cirrus at 1030 GMT. At 1100 GMT cumulus were forming over land to the north of the track and there was a band of cumulus and stratocumulus approaching from the west. There was also thin cirrus overhead and spreading. Heavy clouds began moving in from the west at 1220 GMT and the cirrus was thickening overhead. Cloud amounts were noted as 3/8 Ci & Cc at 1030 GMT; becoming 2/8 Cu and 6/8 Ci at 1123 GMT; and 1/8 Cu at 1200 meters (4000 feet), 8/8 As at 2700 meters (9000 feet), and overcast Ci at 1215 GMT.

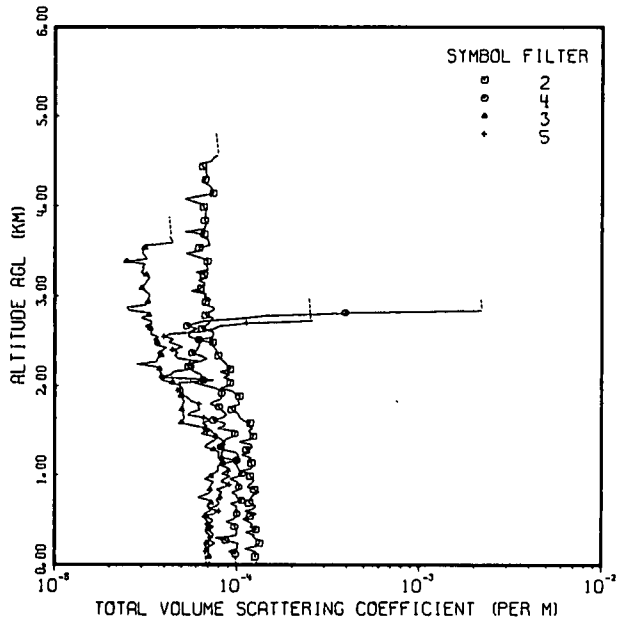
Local Weather Notes. Trapani, 41 kilometers northeast of the flight track, reported 3/8 to 4/8 cumulus and cumulonimbus at 450 meters (1500 feet), 4/8 to 8/8 altostratus at 2700 meters (9000 feet) and 4/8 to 6/8 cirrus at 6000 meters (20,000 feet). Visibility was 11.2 kilometers.

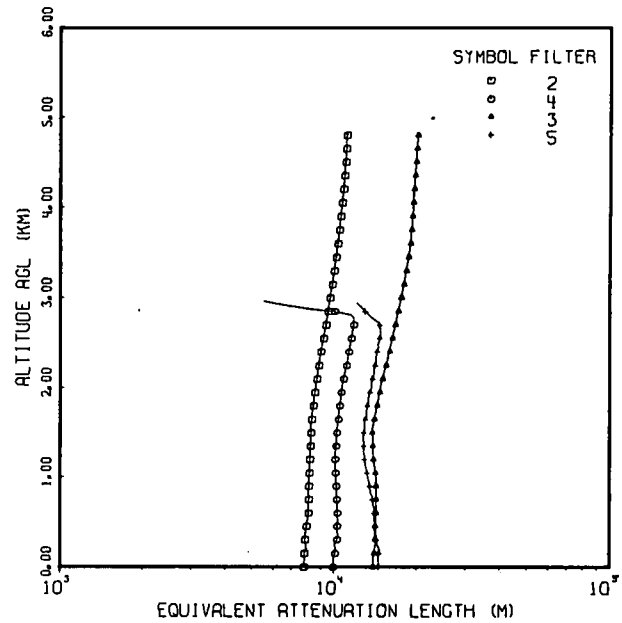
Pantelleria, an island 94 kilometers southwest of the track, reported varying amounts of cumulus ranging from 3/8 to 6/8 at 450 meters (1500 feet) lowering by 1400 GMT to 330 meters (1100 feet), 4/8 to 8/8 altostratus at 2700 meters (9000 feet) and 5/8 to 6/8 thin cirrus at 6000 meters (20,000 feet). Visibility was 11.2 kilometers with light rain reported on the 1400 GMT observation.

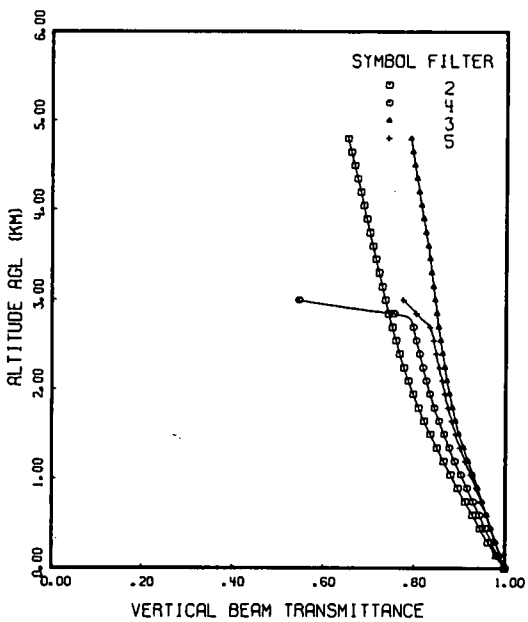
The radiosonde station at Trapani was northeast and in an airflow parallel to the track. The vertical cross section for 1500 GMT showed 3/8 clouds at 650 meters, 8/8 cloud from 2000 to 4350 meters, 4/8 clouds from 5500 to 6600 meters and clear above.

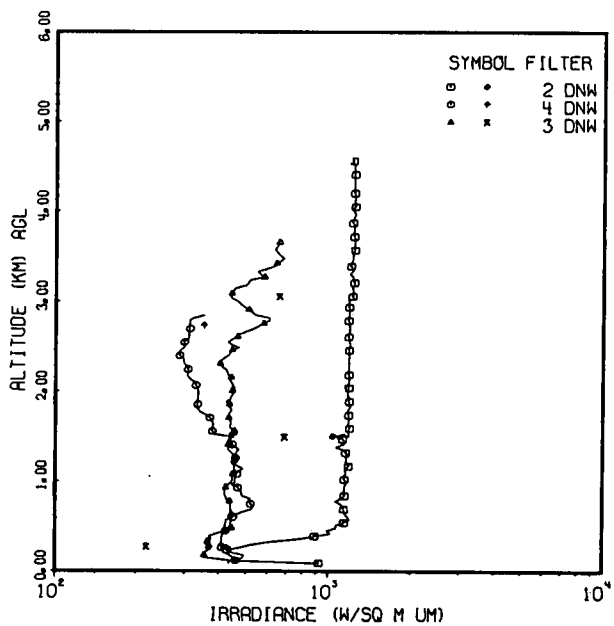
Synoptic Remarks. The surface chart showed a deepening low with associated frontal systems that was centered off Northern Ireland. The occluded front extended southeast to London, the warm front from London to Lyon, and the cold front from London westsouthwest into the Atlantic. There was another low centered in northern Greece. Sicily was in a col between these lows and a ridge from the Atlantic High over Algeria and Tunisia. At 500 millibars a cold trough extended southsouthwest from Denmark to Sicily and Libya. There was moderate northwesterly flow at this level. The air mass was unstable maritime polar.

FLIGHT NO. C-431
TRAPANI









FLIGHT NO. C-431
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6449 DATE 03/29/79)
DATE 20178 FLIGHT NO. C-431 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(1.28E-04)	(1.00E-04)	(7.18E-05)	(6.89E-05)
30	(1.27E-04)	(9.97E-05)	(7.14E-05)	(6.86E-05)
60	(1.27E-04)	(9.95E-05)	(7.13E-05)	(6.84E-05)
90	1.27E-04	(9.92E-05)	7.11E-05	(6.82E-05)
120	1.28E-04	9.90E-05	7.02E-05	(6.80E-05)
150	1.28E-04	9.03E-05	6.97E-05	6.79E-05
180	1.10E-04	1.01E-04	7.05E-05	6.75E-05
210	1.29E-04	1.00E-04	6.70E-05	7.18E-05
240	1.34E-04	1.03E-04	6.86E-05	7.65E-05
270	1.34E-04	8.72E-05	7.16E-05	7.11E-05
300	1.24E-04	7.70E-05	7.21E-05	7.16E-05
330	1.26E-04	9.97E-05	7.16E-05	7.52E-05
360	1.12E-04	1.00E-04	6.75E-05	7.22E-05
390	1.28E-04	1.00E-04	6.99E-05	6.93E-05
420	1.18E-04	9.77E-05	7.15E-05	7.53E-05
450	1.23E-04	9.75E-05	7.14E-05	6.89E-05
480	1.17E-04	8.74E-05	7.02E-05	7.39E-05
510	1.08E-04	9.61E-05	6.70E-05	7.30E-05
540	1.19E-04	9.99E-05	6.77E-05	6.46E-05
570	1.30E-04	1.00E-04	6.66E-05	7.59E-05
600	1.11E-04	9.84E-05	7.21E-05	7.94E-05
630	1.25E-04	1.01E-04	7.25E-05	6.99E-05
660	1.26E-04	9.98E-05	6.85E-05	7.82E-05
690	1.17E-04	9.25E-05	7.25E-05	8.08E-05
720	1.19E-04	1.06E-04	7.21E-05	7.67E-05
750	1.21E-04	1.00E-04	6.08E-05	8.13E-05
780	1.23E-04	9.97E-05	6.70E-05	7.91E-05
810	1.33E-04	9.39E-05	7.22E-05	8.39E-05
840	1.25E-04	1.03E-04	7.14E-05	7.66E-05
870	1.14E-04	1.03E-04	7.12E-05	8.52E-05
900	1.19E-04	1.02E-04	7.27E-05	9.10E-05
930	1.24E-04	1.01E-04	7.50E-05	8.16E-05
960	1.23E-04	9.18E-05	6.67E-05	8.64E-05
990	1.18E-04	1.02E-04	7.22E-05	9.15E-05
1020	1.19E-04	1.07E-04	7.51E-05	8.21E-05
1050	1.05E-04	1.05E-04	7.92E-05	8.99E-05
1080	1.20E-04	1.02E-04	7.80E-05	9.14E-05
1110	1.22E-04	1.00E-04	7.97E-05	8.27E-05
1140	1.20E-04	9.83E-05	8.41E-05	8.05E-05
1170	1.14E-04	1.00E-04	8.15E-05	1.03E-04
1200	1.21E-04	1.02E-04	7.90E-05	8.27E-05
1230	1.05E-04	1.02E-04	8.00E-05	8.20E-05
1260	1.19E-04	9.84E-05	8.06E-05	8.26E-05
1290	1.12E-04	8.39E-05	7.46E-05	8.58E-05
1320	1.23E-04	8.15E-05	6.67E-05	7.73E-05
1350	1.18E-04	8.23E-05	6.91E-05	8.38E-05
1380	1.02E-04	8.60E-05	7.33E-05	8.49E-05
1410	1.20E-04	8.47E-05	7.76E-05	8.11E-05
1440	1.23E-04	9.60E-05	7.63E-05	7.74E-05
1470	1.20E-04	9.77E-05	7.50E-05	6.39E-05
1500	1.15E-04	9.84E-05	7.23E-05	6.82E-05

FLIGHT NO. C-431
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6449 DATE 03/29/79)
DATE 20178 FLIGHT NO. C-431 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M)			
FILTERS	2	4	3	5
1530	1.23E-04	7.80E-05	6.89E-05	6.44E-05
1560	1.14E-04	8.59E-05	5.81E-05	6.90E-05
1590	1.18E-04	8.63E-05	4.95E-05	6.40E-05
1620	1.08E-04	7.41E-05	5.09E-05	7.13E-05
1650	1.04E-04	8.38E-05	5.18E-05	6.56E-05
1680	1.04E-04	8.82E-05	5.05E-05	5.40E-05
1710	9.96E-05	8.45E-05	5.06E-05	5.66E-05
1740	9.37E-05	8.12E-05	4.98E-05	6.31E-05
1770	9.19E-05	7.96E-05	5.01E-05	6.06E-05
1800	1.04E-04	7.13E-05	5.05E-05	6.19E-05
1830	1.01E-04	7.54E-05	5.16E-05	5.56E-05
1860	1.02E-04	8.17E-05	5.04E-05	5.44E-05
1890	1.03E-04	8.21E-05	4.93E-05	5.12E-05
1920	9.68E-05	8.25E-05	5.02E-05	4.95E-05
1950	9.30E-05	8.20E-05	5.12E-05	4.73E-05
1980	8.05E-05	7.61E-05	4.99E-05	4.93E-05
2010	9.03E-05	6.71E-05	4.85E-05	4.81E-05
2040	9.19E-05	5.81E-05	4.44E-05	4.85E-05
2070	9.39E-05	6.55E-05	3.89E-05	7.42E-05
2100	8.44E-05	6.38E-05	4.07E-05	3.83E-05
2130	9.09E-05	6.37E-05	3.85E-05	4.38E-05
2160	8.03E-05	5.94E-05	3.78E-05	4.52E-05
2190	9.24E-05	5.52E-05	3.76E-05	5.66E-05
2220	8.97E-05	5.38E-05	3.56E-05	5.80E-05
2250	8.70E-05	5.25E-05	2.84E-05	5.49E-05
2280	8.44E-05	6.25E-05	3.64E-05	6.12E-05
2310	8.17E-05	6.87E-05	3.66E-05	4.74E-05
2340	7.90E-05	6.32E-05	3.86E-05	4.54E-05
2370	7.73E-05	5.65E-05	3.67E-05	4.77E-05
2400	7.73E-05	6.06E-05	3.94E-05	4.40E-05
2430	7.49E-05	6.09E-05	4.13E-05	5.00E-05
2460	7.33E-05	6.25E-05	3.57E-05	4.60E-05
2490	7.37E-05	6.19E-05	3.65E-05	4.19E-05
2520	5.98E-05	6.19E-05	3.48E-05	4.50E-05
2550	7.32E-05	5.50E-05	3.73E-05	3.97E-05
2580	7.46E-05	5.52E-05	3.37E-05	4.31E-05
2610	7.33E-05	5.57E-05	3.43E-05	6.50E-05
2640	6.41E-05	6.06E-05	3.36E-05	7.52E-05
2670	6.71E-05	5.31E-05	3.13E-05	8.10E-05
2700	7.01E-05	5.94E-05	3.43E-05	1.12E-04
2730	7.17E-05	6.69E-05	3.37E-05	2.55E-04
2760	7.46E-05	1.06E-04	2.98E-05	(2.54E-04)
2790	6.72E-05	1.44E-04	3.29E-05	(2.53E-04)
2820	6.97E-05	3.94E-04	3.27E-05	(2.53E-04)
2850	7.51E-05	2.19E-03	2.55E-05	(2.52E-04)
2880	7.41E-05	(2.19E-03)	2.49E-05	(2.51E-04)
2910	6.61E-05	(2.18E-03)	3.15E-05	(2.50E-04)
2940	6.74E-05	(2.17E-03)	3.26E-05	(2.49E-04)
2970	7.21E-05	(2.17E-03)	3.29E-05	(2.49E-04)
3000	6.61E-05	(2.16E-03)	3.32E-05	(2.48E-04)

FLIGHT NO. C-431
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6449 DATE 03/29/79)
DATE 20178 FLIGHT NO. C-431 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	6.83E-05		3.29E-05	
3060	5.60E-05		3.15E-05	
3090	6.33E-05		3.01E-05	
3120	6.65E-05		3.09E-05	
3150	6.67E-05		3.18E-05	
3180	6.12E-05		3.23E-05	
3210	6.80E-05		3.34E-05	
3240	6.58E-05		3.18E-05	
3270	5.90E-05		2.97E-05	
3300	6.96E-05		3.10E-05	
3330	6.78E-05		3.04E-05	
3360	6.84E-05		3.16E-05	
3390	6.91E-05		2.47E-05	
3420	6.57E-05		3.21E-05	
3450	5.89E-05		3.12E-05	
3480	5.21E-05		3.04E-05	
3510	6.21E-05		3.07E-05	
3540	6.19E-05		3.12E-05	
3570	7.10E-05		3.18E-05	
3600	6.93E-05		4.47E-05	
3630	6.90E-05		4.38E-05	
3660	6.42E-05		4.30E-05	
3690	6.62E-05		(4.29E-05)	
3720	5.19E-05		(4.27E-05)	
3750	6.59E-05		(4.26E-05)	
3780	6.66E-05		(4.25E-05)	
3810	6.80E-05		(4.23E-05)	
3840	6.65E-05		(4.22E-05)	
3870	6.75E-05		(4.21E-05)	
3900	6.73E-05		(4.19E-05)	
3930	6.77E-05			
3960	6.80E-05			
3990	6.56E-05			
4020	6.47E-05			
4050	5.79E-05			
4080	5.18E-05			
4110	6.12E-05			
4140	7.41E-05			
4170	7.22E-05			
4200	7.34E-05			
4230	6.96E-05			
4260	6.57E-05			
4290	6.68E-05			
4320	6.85E-05			
4350	6.76E-05			
4380	6.75E-05			
4410	6.74E-05			
4440	6.46E-05			
4470	6.27E-05			
4500	7.25E-05			

FLIGHT NO. C-431
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6449 DATE 03/29/79)
DATE 20178 FLIGHT NO. C-431 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
4530	7.42E-05			
4560	7.77E-05			
4590	(7.74E-05)			
4620	(7.72E-05)			
4650	(7.69E-05)			
4680	(7.67E-05)			
4710	(7.65E-05)			
4740	(7.62E-05)			
4770	(7.60E-05)			
4800	(7.57E-05)			
FIRST DATA ALT	90	120	90	150
LAST DATA ALT	4560	2850	3660	2730

FLIGHT NO. C-431
EQUIVALENT ATTENUATION LENGTH

(JOB 6449 DATE 03/29/79)
DATE 20178 FLIGHT NO. C-431 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(7.82E 03)	(9.98E 03)	(1.39E 04)	(1.45E 04)
300	7.86E 03	1.03E 04	1.42E 04	1.43E 04
600	8.11E 03	1.03E 04	1.43E 04	1.41E 04
900	8.14E 03	1.02E 04	1.43E 04	1.35E 04
1200	8.21E 03	1.01E 04	1.40E 04	1.29E 04
1500	8.29E 03	1.03E 04	1.38E 04	1.29E 04
1800	8.45E 03	1.06E 04	1.44E 04	1.33E 04
2100	8.70E 03	1.09E 04	1.51E 04	1.39E 04
2400	9.00E 03	1.14E 04	1.60E 04	1.44E 04
2700	9.38E 03	1.18E 04	1.68E 04	1.47E 04
3000	9.71E 03	(4.92E 03)	1.76E 04	(1.17E 04)
3300	1.01E 04		1.84E 04	
3600	1.04E 04		1.91E 04	
3900	1.06E 04		(1.93E 04)	
4200	1.09E 04			
4500	1.11E 04			
4800	(1.12E 04)			

FLIGHT NO. C-431
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

$\tau_{R1} = 0.0179$

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.63E-01	9.71E-01	9.79E-01	9.79E-01
600	9.29E-01	9.44E-01	9.59E-01	9.58E-01
900	8.95E-01	9.16E-01	9.39E-01	9.36E-01
1200	8.64E-01	8.88E-01	9.18E-01	9.11E-01
1500	8.34E-01	8.64E-01	8.97E-01	8.90E-01
1800	8.08E-01	8.43E-01	8.83E-01	8.73E-01
2100	7.86E-01	8.25E-01	8.70E-01	8.59E-01
2400	7.66E-01	8.10E-01	8.61E-01	8.47E-01
2700	7.50E-01	7.96E-01	8.51E-01	8.32E-01
3000	7.34E-01	(5.44E-01)	8.44E-01	(7.73E-01)
3300	7.20E-01		8.36E-01	
3600	7.06E-01		8.28E-01	
3900	6.93E-01		(8.17E-01)	
4200	6.79E-01			
4500	6.66E-01			
4800	(6.50E-01)			

FLIGHT C-432 - 3 FEBRUARY 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
4,5,2,3	1229	1412	1.72	56.2	-	67.0	6060	Sea Level

Flight Description. Flight C-432 was an afternoon flight with take off at 1125 GMT and landing at 1505 GMT. Scattered cumulus clouds were dissipating over the track. The approximate northwest to southeast Trapani track was located west of Sicily. Typical terrain features along the nearby coast were brown and green rolling fields. Directly below the track were the relatively shallow waters of the Strait of Sicily. The flight consisted of V-PRO's only.

In-Flight Notes. The in-flight observer reported 2/8 to 4/8 cumulus with bases at 910 to 1200 meters (3000-4000 feet) and clear above 1800 meters (6000 feet). Visibility in haze below the clouds was less than 16 kilometers (10 miles). On the descent at 1230 GMT visibility toward the sun was 4.8 kilometers (3 miles) and away from the sun was 16 kilometers (10 miles). Top of the haze was 1500 meters (5000 feet).

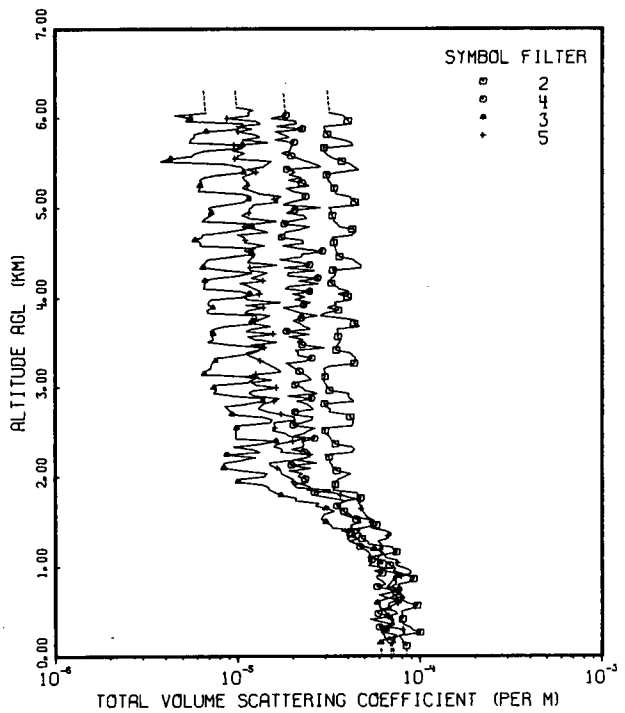
Local Weather Notes. Trapani, 41 kilometers northeast of the flight track, reported 1/8 to 2/8 cumulus and stratocumulus at 450 meters (1500 feet) and 8/8 altostratus at 2400 meters (8000 feet). Visibility was 11.2 kilometers lowering to 7.0 to 9.0 kilometers in light rain by 1200 GMT.

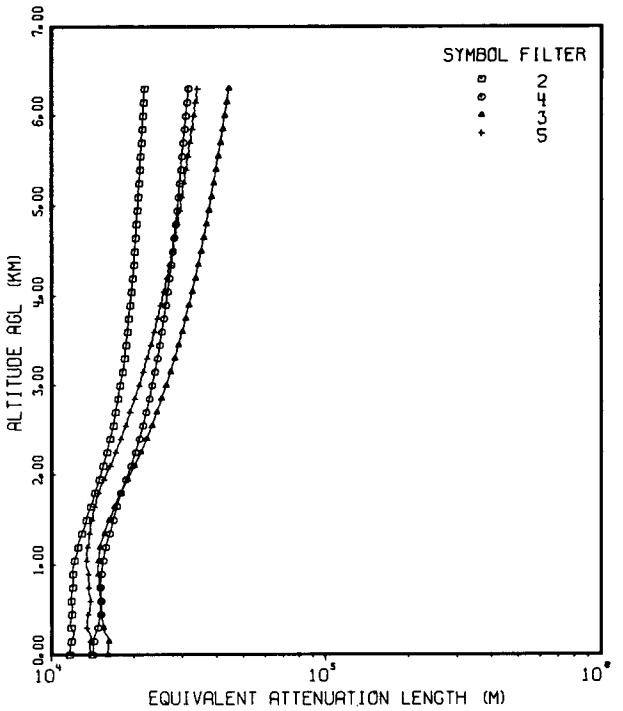
Pantelleria, an island 94 kilometers southwest of the track, reported 2/8 to 5/8 cumulus clouds at 450 to 630 meters (1500 to 2100 feet), 3/8 altocumulus at 3000 meters (10,000 feet) and 6/8 cirrus at 6000 meters (20,000 feet) decreasing to 4/8 coverage by 1300 GMT. Visibility was 11.2 kilometers and surface winds were gusty.

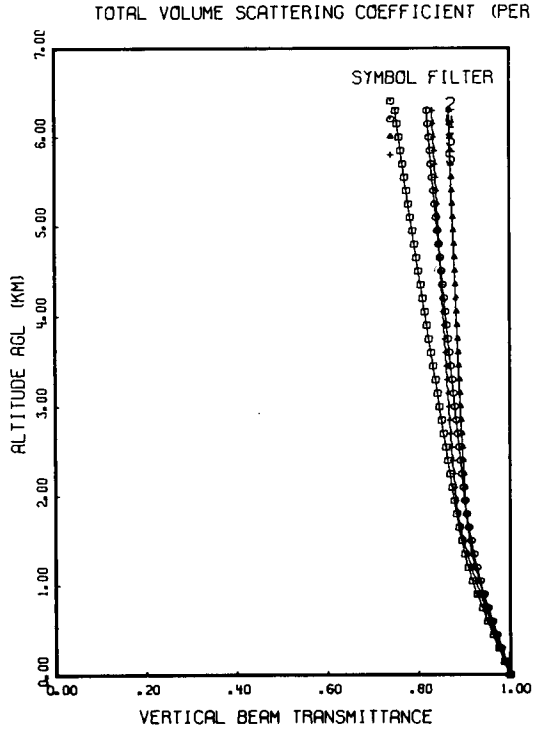
The radiosonde station at Trapani was northeast and in an airflow parallel to the track. The vertical cross section for 1200 GMT showed 3/8 clouds from 650 to 1500 meters, 7/8 clouds from 2000 to 5500 meters and clear above.

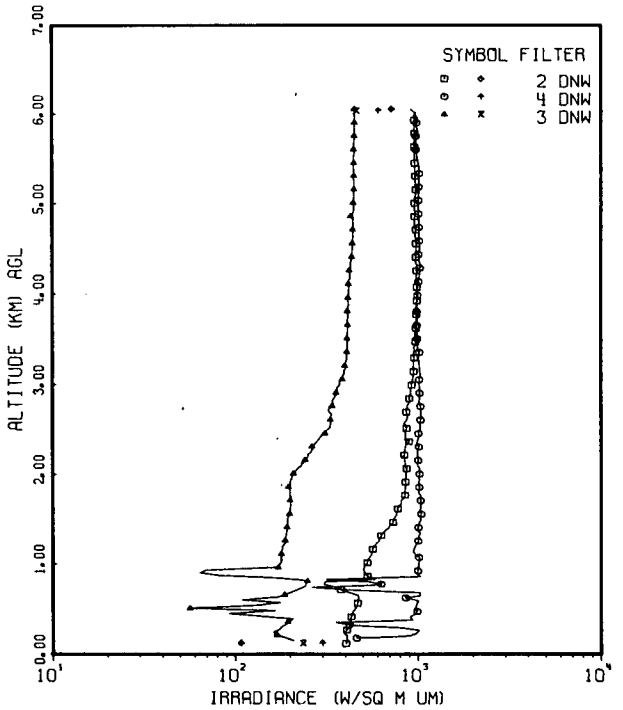
Synoptic Remarks. The surface chart showed a low in central Greece. A cold front had moved south and extended from southern Greece through central Tunisia and extreme southern Hispania then connected with a deepening system in mid-Atlantic. The flight track experienced the effects of post cold frontal conditions. At 500 millibars there was a trough from Denmark through Italy and Sicily to Libya. A low was centered near Split, Yugoslavia. There was northwesterly flow over the track and the air mass was unstable maritime polar.

FLIGHT NO. C-432
TRAPANI









FLIGHT NO. C-432
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6457 DATE 03/29/79)
DATE 20378 FLIGHT NO. C-432 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(8.54E-05)	(7.05E-05)	(6.22E-05)	(7.26E-05)
30	(8.50E-05)	(7.01E-05)	(6.19E-05)	(7.22E-05)
60	(8.48E-05)	(6.99E-05)	(6.18E-05)	(7.20E-05)
90	(8.46E-05)	(6.98E-05)	(6.16E-05)	(7.19E-05)
120	8.44E-05	(6.96E-05)	(6.15E-05)	(7.17E-05)
150	8.03E-05	(6.94E-05)	6.13E-05	7.15E-05
180	8.03E-05	6.92E-05	6.26E-05	7.19E-05
210	7.66E-05	6.42E-05	7.08E-05	7.14E-05
240	7.77E-05	6.45E-05	7.50E-05	8.08E-05
270	1.00E-04	6.18E-05	6.35E-05	8.31E-05
300	9.11E-05	6.22E-05	6.55E-05	8.10E-05
330	8.87E-05	6.03E-05	6.60E-05	6.77E-05
360	8.16E-05	7.07E-05	6.96E-05	7.26E-05
390	7.96E-05	6.12E-05	7.17E-05	7.10E-05
420	8.03E-05	5.58E-05	6.76E-05	7.11E-05
450	8.06E-05	7.07E-05	6.65E-05	6.78E-05
480	8.05E-05	5.93E-05	7.56E-05	6.57E-05
510	7.94E-05	6.01E-05	7.20E-05	6.36E-05
540	9.04E-05	6.97E-05	6.08E-05	6.58E-05
570	9.69E-05	6.67E-05	6.11E-05	7.08E-05
600	8.56E-05	6.32E-05	5.86E-05	7.63E-05
630	8.09E-05	7.60E-05	6.20E-05	7.69E-05
660	7.97E-05	6.58E-05	6.95E-05	8.31E-05
690	7.82E-05	6.03E-05	7.54E-05	7.90E-05
720	7.46E-05	7.03E-05	7.44E-05	7.30E-05
750	7.43E-05	6.04E-05	7.71E-05	7.62E-05
780	7.69E-05	5.37E-05	6.63E-05	6.99E-05
810	7.59E-05	5.49E-05	6.93E-05	7.43E-05
840	8.87E-05	6.23E-05	7.06E-05	7.49E-05
870	9.27E-05	5.37E-05	7.41E-05	7.05E-05
900	8.94E-05	5.80E-05	7.43E-05	7.87E-05
930	7.92E-05	6.26E-05	7.79E-05	8.92E-05
960	7.15E-05	5.65E-05	6.36E-05	8.98E-05
990	7.43E-05	6.72E-05	6.09E-05	8.25E-05
1020	6.82E-05	5.28E-05	5.92E-05	7.40E-05
1050	6.62E-05	5.53E-05	6.05E-05	7.58E-05
1080	6.32E-05	5.49E-05	5.81E-05	7.43E-05
1110	5.24E-05	5.19E-05	5.95E-05	6.48E-05
1140	6.09E-05	5.39E-05	6.17E-05	6.47E-05
1170	7.48E-05	5.28E-05	6.27E-05	6.17E-05
1200	7.18E-05	4.99E-05	5.61E-05	6.11E-05
1230	7.00E-05	4.71E-05	5.00E-05	6.20E-05
1260	5.26E-05	4.58E-05	4.45E-05	6.10E-05
1290	5.23E-05	4.12E-05	4.11E-05	5.85E-05
1320	4.81E-05	4.64E-05	3.99E-05	6.64E-05
1350	4.76E-05	3.95E-05	4.29E-05	6.73E-05
1380	4.76E-05	4.16E-05	4.55E-05	7.03E-05
1410	3.76E-05	3.73E-05	4.69E-05	6.34E-05
1440	4.75E-05	4.25E-05	3.34E-05	5.39E-05
1470	5.81E-05	4.14E-05	3.28E-05	5.48E-05
1500	5.72E-05	4.77E-05	3.05E-05	5.45E-05

FLIGHT NO. C-432
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6457 DATE 03/29/79)
DATE 20378 FLIGHT NO. C-432 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	5.49E-05	4.50E-05	2.86E-05	5.35E-05
1560	4.26E-05	4.14E-05	2.95E-05	5.13E-05
1590	4.15E-05	3.76E-05	3.03E-05	5.00E-05
1620	3.83E-05	3.66E-05	3.40E-05	4.90E-05
1650	3.63E-05	3.72E-05	3.07E-05	4.77E-05
1680	3.55E-05	3.51E-05	2.67E-05	4.77E-05
1710	3.68E-05	3.63E-05	2.81E-05	4.59E-05
1740	3.82E-05	3.99E-05	2.09E-05	4.88E-05
1770	4.75E-05	3.29E-05	2.11E-05	4.21E-05
1800	4.61E-05	2.69E-05	1.72E-05	3.70E-05
1830	4.51E-05	2.65E-05	1.60E-05	3.29E-05
1860	3.36E-05	3.25E-05	1.49E-05	2.42E-05
1890	3.44E-05	2.11E-05	1.48E-05	2.52E-05
1920	3.44E-05	2.04E-05	1.33E-05	2.25E-05
1950	3.45E-05	2.44E-05	1.01E-05	2.02E-05
1980	3.61E-05	2.35E-05	1.00E-05	2.00E-05
2010	3.91E-05	2.13E-05	1.40E-05	1.85E-05
2040	4.21E-05	2.28E-05	1.46E-05	1.73E-05
2070	3.52E-05	1.92E-05	1.09E-05	1.72E-05
2100	3.33E-05	2.51E-05	8.41E-06	1.66E-05
2130	3.31E-05	1.97E-05	8.45E-06	1.50E-05
2160	3.23E-05	2.71E-05	8.54E-06	1.52E-05
2190	3.20E-05	2.10E-05	1.06E-05	2.01E-05
2220	3.18E-05	2.44E-05	1.26E-05	2.42E-05
2250	3.02E-05	2.48E-05	8.73E-06	2.51E-05
2280	4.27E-05	2.33E-05	1.32E-05	1.74E-05
2310	4.40E-05	1.98E-05	1.20E-05	1.78E-05
2340	4.21E-05	2.30E-05	9.57E-06	1.58E-05
2370	3.45E-05	2.30E-05	1.31E-05	1.68E-05
2400	3.30E-05	2.25E-05	1.62E-05	1.99E-05
2430	3.24E-05	2.66E-05	9.81E-06	2.34E-05
2460	3.18E-05	2.04E-05	9.89E-06	1.92E-05
2490	3.02E-05	2.33E-05	9.86E-06	1.83E-05
2520	3.03E-05	2.47E-05	9.87E-06	1.56E-05
2550	2.96E-05	2.67E-05	9.89E-06	1.61E-05
2580	4.27E-05	2.03E-05	1.04E-05	1.58E-05
2610	4.33E-05	2.30E-05	1.51E-05	1.58E-05
2640	4.29E-05	2.57E-05	1.55E-05	2.07E-05
2670	4.19E-05	2.59E-05	1.36E-05	2.04E-05
2700	4.08E-05	2.02E-05	9.33E-06	1.75E-05
2730	3.19E-05	2.06E-05	9.21E-06	1.45E-05
2760	3.26E-05	2.61E-05	8.79E-06	1.30E-05
2790	3.03E-05	2.49E-05	8.54E-06	1.35E-05
2820	2.98E-05	2.38E-05	1.12E-05	1.40E-05
2850	4.36E-05	2.12E-05	1.37E-05	1.58E-05
2880	4.13E-05	2.56E-05	1.42E-05	1.70E-05
2910	4.05E-05	1.90E-05	9.47E-06	1.24E-05
2940	4.10E-05	2.73E-05	7.42E-06	1.15E-05
2970	3.21E-05	2.34E-05	7.72E-06	1.24E-05
3000	3.15E-05	2.29E-05	7.38E-06	1.63E-05

FLIGHT NO. C-432
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6457 DATE 03/29/79)
DATE 20378 FLIGHT NO. C-432 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	3.09E-05	2.06E-05	7.68E-06	1.26E-05
3060	3.01E-05	2.12E-05	1.14E-05	1.19E-05
3090	2.99E-05	2.53E-05	1.22E-05	1.53E-05
3120	3.02E-05	2.42E-05	1.31E-05	1.11E-05
3150	3.04E-05	2.30E-05	6.54E-06	1.26E-05
3180	3.02E-05	2.19E-05	6.64E-06	1.72E-05
3210	2.98E-05	2.08E-05	7.14E-06	1.63E-05
3240	3.21E-05	1.96E-05	7.10E-06	1.53E-05
3270	4.39E-05	1.85E-05	7.21E-06	1.44E-05
3300	4.52E-05	2.37E-05	7.57E-06	1.34E-05
3330	4.47E-05	2.56E-05	7.65E-06	1.24E-05
3360	4.32E-05	2.15E-05	9.75E-06	1.15E-05
3390	4.17E-05	2.17E-05	1.22E-05	1.12E-05
3420	3.49E-05	2.07E-05	1.33E-05	1.30E-05
3450	3.51E-05	3.00E-05	1.37E-05	1.40E-05
3480	3.57E-05	2.26E-05	9.18E-06	1.19E-05
3510	3.67E-05	2.13E-05	6.93E-06	1.63E-05
3540	3.65E-05	2.29E-05	7.40E-06	1.25E-05
3570	3.57E-05	1.91E-05	7.19E-06	1.14E-05
3600	3.55E-05	2.46E-05	7.34E-06	1.57E-05
3630	3.56E-05	1.86E-05	7.07E-06	1.12E-05
3660	3.54E-05	2.51E-05	7.54E-06	1.21E-05
3690	4.70E-05	2.28E-05	8.62E-06	1.52E-05
3720	4.40E-05	2.19E-05	1.20E-05	1.21E-05
3750	4.60E-05	2.02E-05	1.20E-05	1.25E-05
3780	3.83E-05	2.24E-05	1.28E-05	1.40E-05
3810	2.87E-05	2.75E-05	1.25E-05	1.51E-05
3840	3.06E-05	2.22E-05	6.93E-06	1.11E-05
3870	3.59E-05	2.00E-05	6.86E-06	1.16E-05
3900	3.12E-05	1.79E-05	7.30E-06	1.39E-05
3930	3.48E-05	2.31E-05	6.92E-06	1.12E-05
3960	3.42E-05	2.52E-05	6.95E-06	1.71E-05
3990	4.20E-05	2.07E-05	7.21E-06	1.14E-05
4020	4.04E-05	2.36E-05	1.10E-05	1.06E-05
4050	3.58E-05	2.00E-05	1.17E-05	1.32E-05
4080	4.10E-05	2.49E-05	1.02E-05	1.31E-05
4110	3.59E-05	1.84E-05	6.53E-06	1.23E-05
4140	3.44E-05	1.96E-05	6.70E-06	1.15E-05
4170	3.30E-05	2.79E-05	6.66E-06	1.03E-05
4200	3.19E-05	2.19E-05	6.62E-06	1.38E-05
4230	3.32E-05	2.77E-05	7.53E-06	1.19E-05
4260	3.46E-05	1.89E-05	1.02E-05	1.33E-05
4290	3.41E-05	1.92E-05	1.20E-05	1.46E-05
4320	3.34E-05	2.64E-05	8.76E-06	1.19E-05
4350	4.76E-05	1.82E-05	6.48E-06	1.18E-05
4380	4.76E-05	2.49E-05	6.54E-06	1.65E-05
4410	4.46E-05	2.15E-05	6.75E-06	1.14E-05
4440	4.33E-05	1.72E-05	6.95E-06	1.19E-05
4470	3.64E-05	2.23E-05	9.11E-06	1.23E-05
4500	3.56E-05	2.27E-05	1.20E-05	1.21E-05

FLIGHT NO. C-432
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6457 DATE 03/29/79)
DATE 20378 FLIGHT NO. C-432 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
4530	3.49E-05	2.94E-05	1.13E-05	1.09E-05
4560	3.46E-05	2.21E-05	1.25E-05	1.15E-05
4590	3.44E-05	1.78E-05	6.32E-06	1.40E-05
4620	3.39E-05	2.30E-05	6.32E-06	1.13E-05
4650	3.41E-05	2.25E-05	5.86E-06	1.10E-05
4680	3.34E-05	1.74E-05	6.42E-06	1.08E-05
4710	4.29E-05	1.81E-05	6.43E-06	1.00E-05
4740	4.51E-05	1.86E-05	8.68E-06	1.46E-05
4770	4.31E-05	2.22E-05	1.07E-05	1.26E-05
4800	3.65E-05	2.49E-05	1.20E-05	1.10E-05
4830	3.57E-05	1.81E-05	1.23E-05	1.20E-05
4860	3.40E-05	1.96E-05	6.44E-06	1.63E-05
4890	3.39E-05	2.40E-05	6.78E-06	1.18E-05
4920	3.33E-05	2.30E-05	7.16E-06	1.06E-05
4950	3.29E-05	1.87E-05	7.20E-06	1.15E-05
4980	3.28E-05	2.07E-05	7.02E-06	1.14E-05
5010	3.19E-05	2.87E-05	7.06E-06	1.21E-05
5040	4.68E-05	1.80E-05	8.69E-06	1.24E-05
5070	4.43E-05	1.96E-05	1.09E-05	1.66E-05
5100	4.25E-05	2.29E-05	1.16E-05	1.61E-05
5130	4.19E-05	2.38E-05	1.20E-05	1.75E-05
5160	3.49E-05	2.34E-05	1.03E-05	1.33E-05
5190	3.44E-05	2.00E-05	6.12E-06	1.20E-05
5220	3.40E-05	1.86E-05	6.29E-06	1.07E-05
5250	3.37E-05	2.47E-05	6.24E-06	1.13E-05
5280	3.27E-05	2.26E-05	6.45E-06	1.15E-05
5310	3.16E-05	1.90E-05	6.16E-06	1.09E-05
5340	3.17E-05	2.25E-05	6.58E-06	1.06E-05
5370	3.09E-05	1.92E-05	7.83E-06	1.14E-05
5400	3.58E-05	2.09E-05	1.08E-05	1.26E-05
5430	4.67E-05	1.86E-05	1.10E-05	1.13E-05
5460	4.35E-05	2.85E-05	1.03E-05	1.39E-05
5490	4.15E-05	2.63E-05	8.60E-06	1.47E-05
5520	3.77E-05	2.41E-05	3.82E-06	1.54E-05
5550	3.39E-05	2.20E-05	4.29E-06	9.75E-06
5580	3.19E-05	1.98E-05	5.66E-06	1.02E-05
5610	3.06E-05	1.76E-05	5.96E-06	1.10E-05
5640	2.98E-05	1.96E-05	6.70E-06	9.41E-06
5670	2.99E-05	1.94E-05	1.01E-05	1.07E-05
5700	4.33E-05	2.02E-05	1.06E-05	9.65E-06
5730	4.21E-05	2.06E-05	5.49E-06	1.46E-05
5760	3.81E-05	1.62E-05	5.61E-06	1.08E-05
5790	3.30E-05	1.93E-05	5.83E-06	1.32E-05
5820	3.12E-05	1.76E-05	5.78E-06	1.23E-05
5850	3.05E-05	1.61E-05	6.76E-06	1.02E-05
5880	3.03E-05	2.28E-05	1.01E-05	1.21E-05
5910	3.01E-05	1.66E-05	1.08E-05	9.97E-06
5940	4.21E-05	2.09E-05	1.07E-05	1.33E-05
5970	4.06E-05	2.07E-05	5.23E-06	1.24E-05
6000	3.95E-05	1.55E-05	5.53E-06	8.84E-06

FLIGHT NO. C-432
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6457 DATE 03/29/79)
DATE 20378 FLIGHT NO. C-432 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
6030	3.83E-05	1.85E-05	4.54E-06	1.16E-05
6060	3.22E-05	(1.84E-05)	6.73E-06	1.15E-05
6090	(3.21E-05)	(1.84E-05)	(6.71E-06)	1.22E-05
6120	(3.19E-05)	(1.83E-05)	(6.68E-06)	9.97E-06
6150	(3.18E-05)	(1.83E-05)	(6.66E-06)	(9.94E-06)
6180	(3.17E-05)	(1.82E-05)	(6.64E-06)	(9.91E-06)
6210	(3.16E-05)	(1.81E-05)	(6.62E-06)	(9.87E-06)
6240	(3.15E-05)	(1.81E-05)	(6.60E-06)	(9.84E-06)
6270	(3.14E-05)	(1.80E-05)	(6.58E-06)	(9.81E-06)
6300	(3.13E-05)	(1.80E-05)	(6.56E-06)	(9.78E-06)
FIRST DATA ALT	120	180	150	150
LAST DATA ALT	6060	6030	6060	6120

FLIGHT NO. C-432
EQUIVALENT ATTENUATION LENGTH

(JOB 6457 DATE 03/29/79)
DATE 20378 FLIGHT NO. C-432 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(1.17E 04)	(1.42E 04)	(1.61E 04)	(1.38E 04)
300	1.18E 04	1.48E 04	1.55E 04	1.35E 04
600	1.18E 04	1.52E 04	1.52E 04	1.39E 04
900	1.20E 04	1.53E 04	1.48E 04	1.37E 04
1200	1.25E 04	1.58E 04	1.51E 04	1.36E 04
1500	1.35E 04	1.69E 04	1.63E 04	1.41E 04
1800	1.45E 04	1.80E 04	1.79E 04	1.49E 04
2100	1.55E 04	1.96E 04	2.01E 04	1.64E 04
2400	1.64E 04	2.10E 04	2.23E 04	1.80E 04
2700	1.72E 04	2.23E 04	2.43E 04	1.94E 04
3000	1.79E 04	2.34E 04	2.63E 04	2.10E 04
3300	1.86E 04	2.45E 04	2.83E 04	2.24E 04
3600	1.90E 04	2.54E 04	3.01E 04	2.38E 04
3900	1.95E 04	2.63E 04	3.19E 04	2.51E 04
4200	1.99E 04	2.71E 04	3.37E 04	2.64E 04
4500	2.02E 04	2.79E 04	3.54E 04	2.76E 04
4800	2.05E 04	2.86E 04	3.70E 04	2.89E 04
5100	2.08E 04	2.92E 04	3.85E 04	3.00E 04
5400	2.11E 04	2.98E 04	4.01E 04	3.11E 04
5700	2.14E 04	3.04E 04	4.16E 04	3.21E 04
6000	2.17E 04	3.11E 04	4.31E 04	3.32E 04
6300	(2.20E 04)	(3.17E 04)	(4.46E 04)	(3.42E 04)

FLIGHT NO. C-432
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

$\tau_R = 0.0121$

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.75E-01	9.80E-01	9.81E-01	9.78E-01
600	9.51E-01	9.61E-01	9.61E-01	9.58E-01
900	9.28E-01	9.43E-01	9.41E-01	9.36E-01
1200	9.09E-01	9.27E-01	9.24E-01	9.15E-01
1500	8.94E-01	9.15E-01	9.12E-01	8.99E-01
1800	8.83E-01	9.05E-01	9.05E-01	8.86E-01
2100	8.73E-01	8.96E-01	9.01E-01	8.80E-01
2400	8.64E-01	8.92E-01	8.98E-01	8.75E-01
2700	8.55E-01	8.86E-01	8.95E-01	8.70E-01
3000	8.46E-01	8.80E-01	8.92E-01	8.67E-01
3300	8.37E-01	8.74E-01	8.90E-01	8.63E-01
3600	8.28E-01	8.68E-01	8.87E-01	8.60E-01
3900	8.18E-01	8.62E-01	8.85E-01	8.56E-01
4200	8.10E-01	8.56E-01	8.83E-01	8.53E-01
4500	8.00E-01	8.51E-01	8.81E-01	8.50E-01
4800	7.91E-01	8.45E-01	8.78E-01	8.47E-01
5100	7.83E-01	8.40E-01	8.76E-01	8.44E-01
5400	7.75E-01	8.35E-01	8.74E-01	8.40E-01
5700	7.66E-01	8.29E-01	8.72E-01	8.37E-01
6000	7.58E-01	8.24E-01	8.70E-01	8.34E-01
6300	(7.51E-01)	(8.20E-01)	(8.68E-01)	(8.32E-01)

FLIGHT C-433 - 17 FEBRUARY 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2	1211	1217	0.10	51.2	-	51.6	1860	Sea Level
3	1224	1232	0.13	52.2	-	52.9	1800	Sea Level
4	1236	1246	0.17	53.1	-	54.0	1770	Sea Level
5	1250	1259	0.15	54.4	-	55.4	1770	Sea Level

Flight Description. Flight C-433 was a midday flight spanning local apparent noon with take off at 1030 and landing at 1315 GMT. There were scattered cumulus clouds and broken middle clouds. The approximate east to west Sigonella track was located east of Sigonella NAF on the east side of Sicily. Typical terrain features along the nearby coast west of the track were cultivated lowlands with fields of brown and green. Directly beneath the track were the relatively deep waters of the Mediterranean. The flight consisted of V-PRO's only.

In-Flight Notes. The in-flight observer noted cloud debris above 1500 meters (5000 feet), uniform light haze surface to 1800 meters (6000 feet) and occasional smoke plumes. Track was modified because of weather conditions on the primary track. Cloud heights, amounts and slant range visibilities were not given.

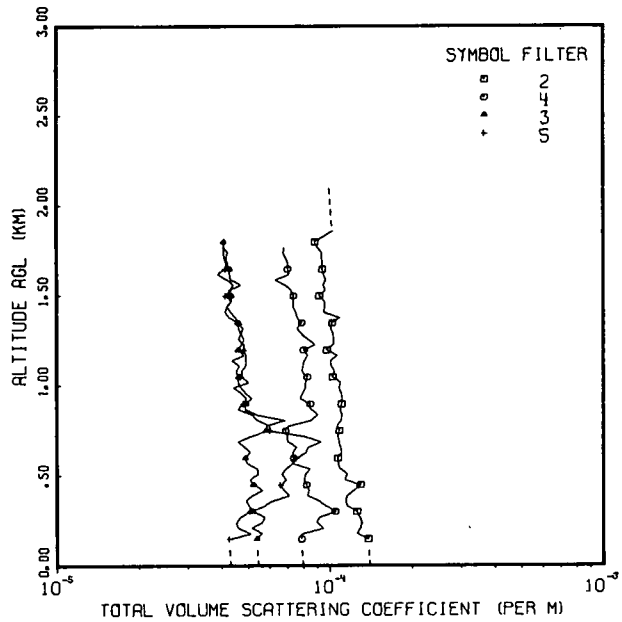
Local Weather Notes. Trapani, 254 kilometers northwest of the flight track, reported 2/8 to 4/8 cumulus at 450 meters (1500 feet) and 7/8 to 8/8 altocumulus at 2400 meters (8000 feet). Visibility was 7.0 kilometers in light fog.

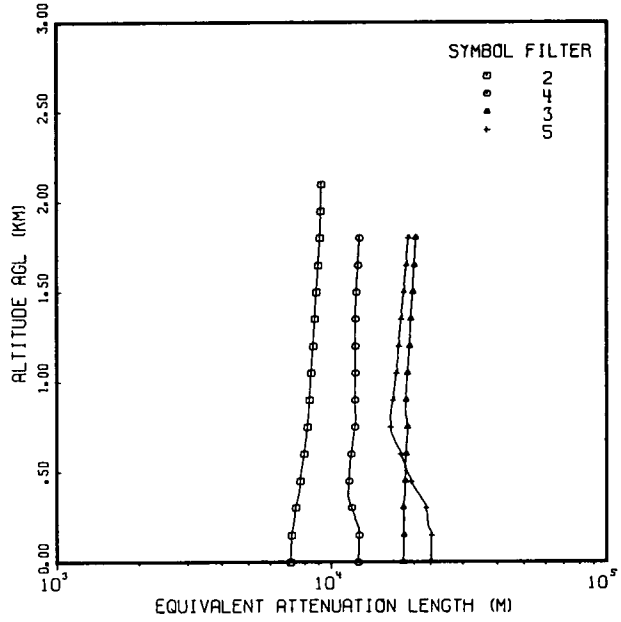
Pantelleria, 304 kilometers southwest of the flight track, reported 2/8 cumulus at 600 meters (2000 feet) increasing to overcast cumulonimbus at the same height at 1200 GMT. Visibility was 11.2 kilometers. Conditions deteriorated to 5/8 fractostratus at 240 meters (800 feet) and visibility 7.0 kilometers in fog.

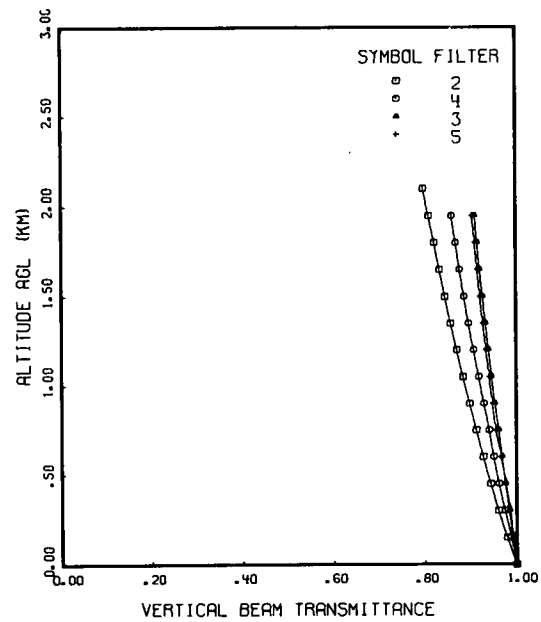
The radiosonde station at Trapani was northwest and upstream from the track. The vertical cross section for 1200 GMT at a location 3° west of the track showed 7/8 cloud from 650 to 1200 meters and clear above.

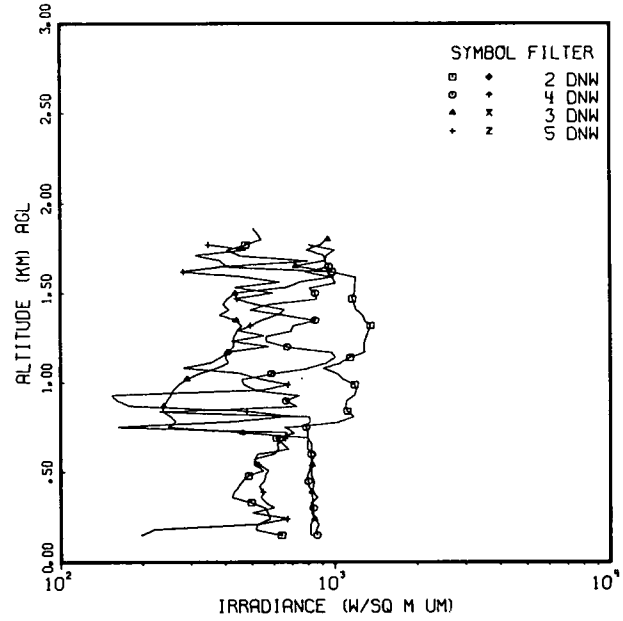
Synoptic Remarks. The surface chart showed a warm front from Naples southeastward into the Ionian Sea. There was a cold front from Naples southwest through the Tyrrhenian Sea then westward passing south of Sardinia. Sicily was situated between the fronts with the cold front approaching Trapani. Warm sector conditions prevailed over the alternate track. The chart also showed an intensive storm in mid-Atlantic. At 500 millibars there was a weak trough from Corsica through Sardinia to Tunisia and Algeria. The flow was westerly over Sicily and the air mass was stable maritime polar.

FLIGHT NO. C-433
SIGONELLA









FLIGHT NO. C-433
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6467 DATE 03/29/79)
DATE 21778 FLIGHT NO. C-433 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(1.40E-04)	(7.97E-05)	(5.47E-05)	(4.34E-05)
30	(1.40E-04)	(7.93E-05)	(5.44E-05)	(4.32E-05)
60	(1.39E-04)	(7.91E-05)	(5.43E-05)	(4.31E-05)
90	(1.39E-04)	(7.89E-05)	(5.41E-05)	(4.30E-05)
120	(1.39E-04)	(7.87E-05)	(5.40E-05)	(4.29E-05)
150	1.38E-04	7.85E-05	5.39E-05	4.28E-05
180	1.26E-04	7.90E-05	5.63E-05	5.09E-05
210	1.30E-04	9.43E-05	5.17E-05	4.60E-05
240	1.31E-04	8.95E-05	5.64E-05	4.56E-05
270	1.28E-04	9.17E-05	5.77E-05	4.71E-05
300	1.26E-04	1.05E-04	5.21E-05	5.09E-05
330	1.16E-04	9.71E-05	5.05E-05	5.74E-05
360	1.14E-04	9.15E-05	4.92E-05	6.15E-05
390	1.16E-04	8.30E-05	5.19E-05	7.08E-05
420	1.23E-04	8.40E-05	5.67E-05	6.77E-05
450	1.30E-04	8.19E-05	5.24E-05	6.59E-05
480	1.13E-04	8.03E-05	5.08E-05	6.92E-05
510	1.16E-04	8.14E-05	5.46E-05	6.64E-05
540	1.09E-04	8.45E-05	5.40E-05	6.92E-05
570	1.08E-04	7.29E-05	4.97E-05	7.32E-05
600	1.07E-04	7.34E-05	4.89E-05	7.53E-05
630	1.11E-04	7.28E-05	5.10E-05	8.16E-05
660	1.09E-04	7.55E-05	4.85E-05	8.34E-05
690	1.08E-04	7.00E-05	4.60E-05	9.30E-05
720	1.07E-04	6.97E-05	5.13E-05	8.06E-05
750	1.08E-04	6.85E-05	5.84E-05	6.03E-05
780	1.06E-04	7.08E-05	5.90E-05	5.96E-05
810	1.10E-04	8.53E-05	6.82E-05	5.39E-05
840	1.11E-04	9.03E-05	5.41E-05	5.18E-05
870	1.09E-04	8.50E-05	4.90E-05	4.61E-05
900	1.11E-04	8.45E-05	4.92E-05	4.80E-05
930	1.11E-04	7.79E-05	5.17E-05	4.94E-05
960	1.10E-04	7.97E-05	4.88E-05	4.72E-05
990	1.08E-04	8.14E-05	4.74E-05	4.42E-05
1020	1.10E-04	8.17E-05	4.63E-05	5.01E-05
1050	1.02E-04	8.26E-05	4.60E-05	4.71E-05
1080	1.04E-04	7.91E-05	4.52E-05	4.75E-05
1110	1.01E-04	7.99E-05	4.67E-05	4.90E-05
1140	1.00E-04	8.06E-05	4.35E-05	4.91E-05
1170	1.06E-04	8.28E-05	4.83E-05	4.91E-05
1200	9.74E-05	8.02E-05	4.61E-05	4.82E-05
1230	1.03E-04	8.82E-05	4.74E-05	4.82E-05
1260	1.03E-04	8.28E-05	4.86E-05	4.62E-05
1290	1.03E-04	7.84E-05	4.72E-05	4.75E-05
1320	1.01E-04	7.58E-05	4.63E-05	4.81E-05
1350	1.02E-04	7.88E-05	4.62E-05	4.58E-05
1380	1.09E-04	7.59E-05	4.27E-05	4.50E-05
1410	9.52E-05	7.51E-05	4.15E-05	4.33E-05
1440	9.61E-05	7.33E-05	4.21E-05	4.19E-05
1470	9.59E-05	7.33E-05	4.36E-05	4.36E-05
1500	9.14E-05	7.34E-05	4.36E-05	4.14E-05

FLIGHT NO. C-433
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6467 DATE 03/29/79)
DATE 21778 FLIGHT NO. C-433 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	9.62E-05	7.21E-05	4.25E-05	4.34E-05
1560	9.44E-05	6.85E-05	4.71E-05	4.43E-05
1590	9.67E-05	6.29E-05	4.34E-05	4.19E-05
1620	9.48E-05	7.07E-05	4.31E-05	3.89E-05
1650	9.39E-05	6.99E-05	4.29E-05	4.12E-05
1680	9.42E-05	7.04E-05	4.17E-05	4.24E-05
1710	9.38E-05	6.90E-05	4.12E-05	4.16E-05
1740	9.37E-05	6.75E-05	4.07E-05	4.24E-05
1770	8.98E-05	6.82E-05	4.10E-05	4.05E-05
1800	8.81E-05	(6.80E-05)	4.08E-05	(4.04E-05)
1830	9.52E-05			
1860	1.02E-04			
1890	(1.02E-04)			
1920	(1.02E-04)			
1950	(1.01E-04)			
1980	(1.01E-04)			
2010	(1.01E-04)			
2040	(1.00E-04)			
2070	(1.00E-04)			
2100	(9.97E-05)			
FIRST DATA ALT	150	150	150	150
LAST DATA ALT	1860	1770	1800	1770

FLIGHT NO. C-433
EQUIVALENT ATTENUATION LENGTH

(JOB 6467 DATE 03/29/79)
DATE 21778 FLIGHT NO. C-433 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(7.12E 03)	(1.25E 04)	(1.83E 04)	(2.30E 04)
300	7.44E 03	1.19E 04	1.83E 04	2.21E 04
600	7.99E 03	1.19E 04	1.88E 04	1.79E 04
900	8.35E 03	1.22E 04	1.87E 04	1.68E 04
1200	8.60E 03	1.23E 04	1.93E 04	1.76E 04
1500	8.85E 03	1.24E 04	1.98E 04	1.84E 04
1800	9.11E 03	(1.27E 04)	2.04E 04	(1.91E 04)
2100	(9.23E 03)			

FLIGHT NO. C-433
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

$T_{R,1} = 0.0234$

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.60E-01	9.75E-01	9.84E-01	9.87E-01
600	9.28E-01	9.51E-01	9.69E-01	9.67E-01
900	8.98E-01	9.29E-01	9.53E-01	9.48E-01
1200	8.70E-01	9.07E-01	9.40E-01	9.34E-01
1500	8.44E-01	8.86E-01	9.27E-01	9.22E-01
1800	8.21E-01	(8.68E-01)	9.15E-01	(9.10E-01)
2100	(7.96E-01)			

FLIGHT C-434 - 18 FEBRUARY 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	0940	1126	1.77	53.7	49.1	49.2	6120	Sea Level
4,5	1132	1325	1.88	49.3	-	58.1	6150	Sea Level

Flight Description. Flight C-434 was a midday flight spanning local apparent noon with take off at 0913 and landing at 1510 GMT. There were scattered middle and high clouds. The approximate east to west Sigonella track was located east of Sigonella NAF on the east side of Sicily. Typical terrain features along the nearby coast were cultivated lowlands with fields of brown and green. Directly beneath the track were the relatively deep waters of the Mediterranean. The track was slid 64 kilometers (40 miles) to the east to stay in the clear at 1045 GMT.

In-Flight Notes. The in-flight observer noted 1/8 to 3/8 cirrus and 1/8 to 3/8 altostratus clouds. Slant visibility was 40 to 48 kilometers (25 to 30 miles). Haze was uniform to the cloud base at 1700 meters (5500 feet) and another haze layer was visible from 2300 to 2600 meters (7500 to 8500 feet).

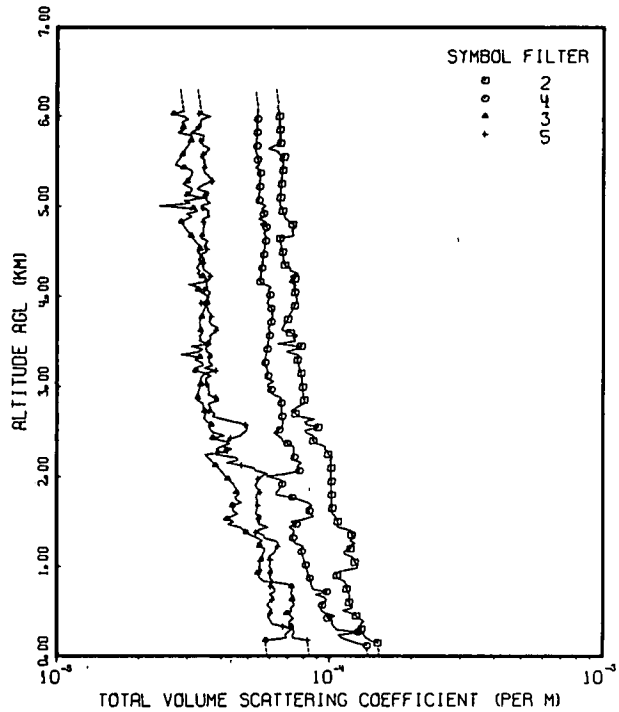
Local Weather Notes. Trapani, 254 kilometers northwest of the flight track, reported 1/8 to 2/8 cumulus at 450 meters (1500 feet) and 3/8 to 7/8 cirrus at 5700 to 6000 meters (19,000 to 20,000 feet). Visibility was 9.0 kilometers in light fog and improved to 11.2 kilometers by 1300 GMT.

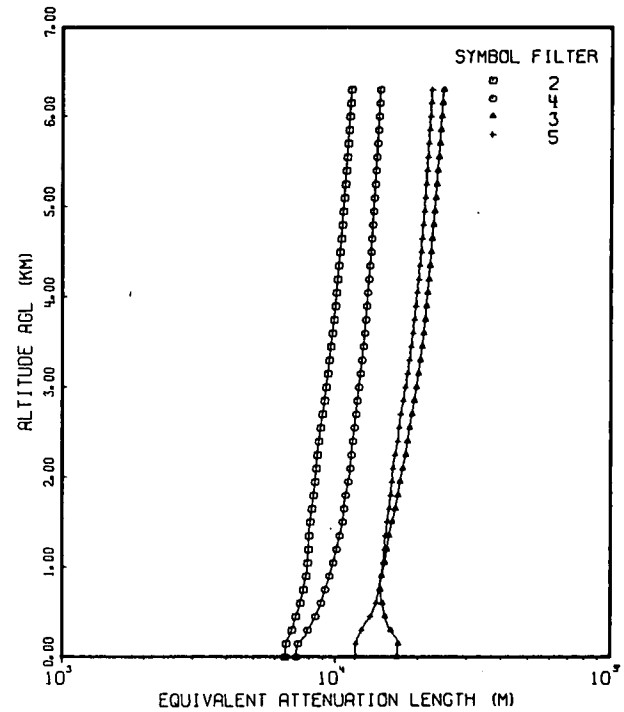
Pantelleria, 304 kilometers southwest of the flight track, reported 5/8 fractostratus at 150 meters (500 feet) becoming 2/8 cumulus at 450 meters (1500 feet) by 1100 GMT. Cirrus clouds at 6000 meters (20,000 feet) decreased from 7/8 to 2/8 by 1300 GMT. Visibility was 5.0 kilometers in light fog and improved to 7.0 kilometers by 1200 GMT.

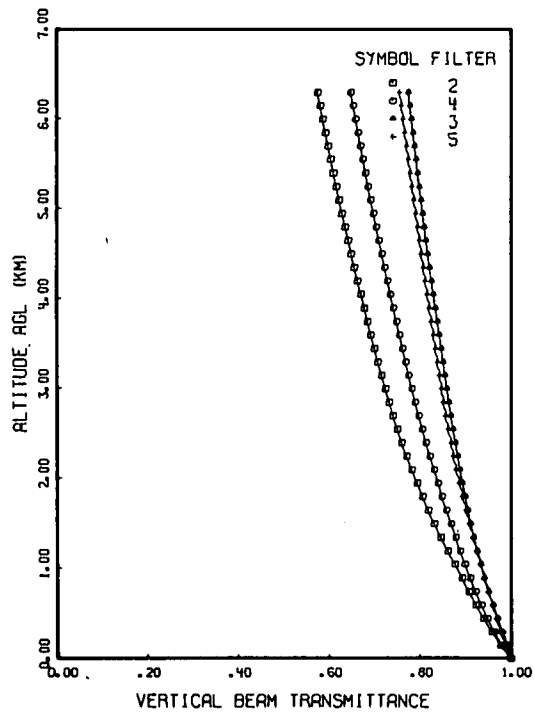
The radiosonde station at Trapani was northwest and upstream from the track. The vertical cross section at 1200 GMT at a location west of the track showed 6/8 coverage of clouds from 400-650 meters, another location south of the track showed 6/8 cloud from the surface to 250 meters, 2/8 at 650 meters, 7/8 cloud from 2000 to 3000 meters, and 3/8 cloud at 8000 meters.

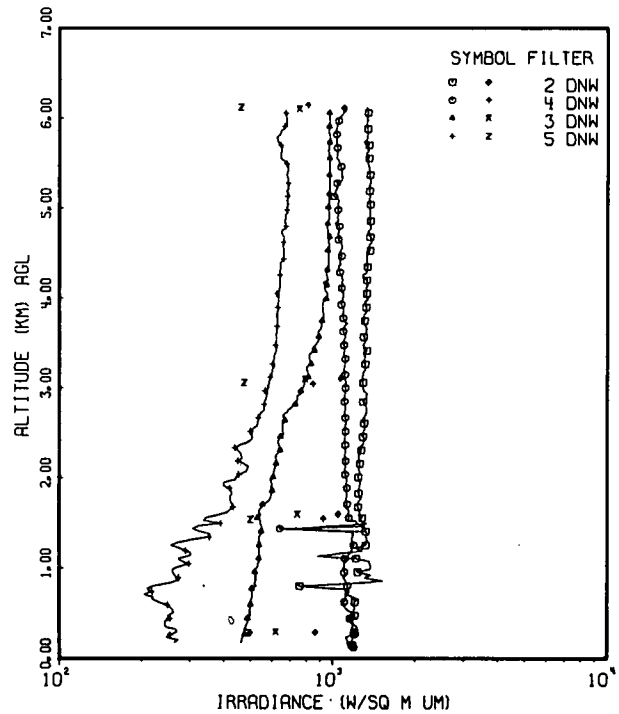
Synoptic Remarks. The surface synoptic chart indicated that the area containing Sicily was in a col at 1200 GMT. There was a warm front in the Pyrenees and a cold front off the coast of Portugal extended northward to southern Ireland. The track was in a col between two storm systems. The 500 millibars chart showed ridging from Morocco to Spain to Britain combined with a trough from Poland to Greece. Sicily was between these systems and in a northwesterly flow. The air mass was unstable maritime polar.

FLIGHT NO. C-434
SIGONELLA









FLIGHT NO. C-434
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6483 DATE 03/29/79)
DATE 21878 FLIGHT NO. C-434 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(1.53E-04)	(1.39E-04)	(5.94E-05)	(8.48E-05)
30	(1.52E-04)	(1.38E-04)	(5.91E-05)	(8.44E-05)
60	(1.52E-04)	(1.38E-04)	(5.90E-05)	(8.41E-05)
90	(1.51E-04)	(1.38E-04)	(5.88E-05)	(8.39E-05)
120	(1.51E-04)	1.37E-04	(5.87E-05)	(8.37E-05)
150	1.50E-04	1.26E-04	(5.85E-05)	(8.35E-05)
180	1.41E-04	1.17E-04	5.84E-05	8.33E-05
210	1.36E-04	1.11E-04	6.95E-05	7.38E-05
240	1.34E-04	1.08E-04	6.88E-05	7.33E-05
270	1.33E-04	1.28E-04	7.05E-05	7.46E-05
300	1.31E-04	1.07E-04	7.28E-05	7.34E-05
330	1.31E-04	1.04E-04	7.23E-05	6.77E-05
360	1.30E-04	1.01E-04	7.17E-05	6.19E-05
390	1.34E-04	1.04E-04	7.12E-05	6.12E-05
420	1.28E-04	9.85E-05	7.40E-05	6.04E-05
450	1.25E-04	1.05E-04	7.18E-05	5.93E-05
480	1.21E-04	9.69E-05	7.00E-05	6.07E-05
510	1.12E-04	9.37E-05	7.29E-05	6.10E-05
540	1.21E-04	9.34E-05	7.15E-05	6.06E-05
570	1.18E-04	9.40E-05	7.46E-05	5.92E-05
600	1.18E-04	9.59E-05	7.34E-05	6.01E-05
630	1.16E-04	9.78E-05	7.30E-05	6.15E-05
660	1.19E-04	9.51E-05	7.45E-05	6.22E-05
690	1.18E-04	8.84E-05	7.21E-05	6.00E-05
720	1.17E-04	9.79E-05	7.27E-05	6.29E-05
750	1.16E-04	8.67E-05	7.33E-05	6.31E-05
780	1.18E-04	8.62E-05	7.26E-05	6.10E-05
810	1.14E-04	8.56E-05	7.03E-05	6.07E-05
840	1.13E-04	8.51E-05	5.74E-05	6.22E-05
870	1.07E-04	8.45E-05	5.57E-05	6.07E-05
900	1.06E-04	8.40E-05	5.51E-05	6.11E-05
930	1.05E-04	8.34E-05	5.46E-05	6.05E-05
960	1.13E-04	8.29E-05	5.67E-05	6.15E-05
990	1.27E-04	8.23E-05	5.46E-05	6.04E-05
1020	1.26E-04	8.18E-05	5.51E-05	6.06E-05
1050	1.24E-04	8.12E-05	5.56E-05	6.10E-05
1080	1.24E-04	8.07E-05	5.61E-05	6.08E-05
1110	1.21E-04	8.01E-05	5.66E-05	5.95E-05
1140	1.14E-04	7.96E-05	5.71E-05	6.18E-05
1170	1.13E-04	7.90E-05	5.77E-05	6.35E-05
1200	1.20E-04	7.92E-05	5.82E-05	6.28E-05
1230	1.18E-04	8.03E-05	5.54E-05	6.48E-05
1260	1.24E-04	7.48E-05	5.44E-05	6.44E-05
1290	1.18E-04	7.41E-05	5.70E-05	6.35E-05
1320	1.24E-04	7.34E-05	5.41E-05	5.78E-05
1350	1.21E-04	7.31E-05	5.17E-05	5.77E-05
1380	1.24E-04	7.40E-05	4.94E-05	5.38E-05
1410	1.18E-04	7.41E-05	4.84E-05	5.46E-05
1440	1.07E-04	7.08E-05	4.70E-05	5.96E-05
1470	1.08E-04	7.56E-05	4.24E-05	5.49E-05
1500	1.07E-04	7.21E-05	4.46E-05	5.55E-05

FLIGHT NO. C-434
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6483 DATE 03/29/79)
DATE 21878 FLIGHT NO. C-434 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	1.06E-04	8.11E-05	4.20E-05	5.47E-05
1560	1.05E-04	8.75E-05	4.39E-05	5.65E-05
1590	1.02E-04	8.43E-05	4.61E-05	5.32E-05
1620	1.02E-04	8.42E-05	4.41E-05	5.44E-05
1650	1.02E-04	8.21E-05	4.46E-05	5.45E-05
1680	1.02E-04	8.63E-05	4.40E-05	5.46E-05
1710	1.02E-04	8.29E-05	4.76E-05	5.35E-05
1740	1.02E-04	7.84E-05	4.54E-05	5.42E-05
1770	1.02E-04	7.28E-05	4.48E-05	5.41E-05
1800	1.02E-04	6.40E-05	4.67E-05	5.40E-05
1830	1.02E-04	6.42E-05	4.56E-05	5.55E-05
1860	1.02E-04	6.53E-05	4.59E-05	5.45E-05
1890	1.02E-04	6.64E-05	4.50E-05	5.35E-05
1920	1.02E-04	6.70E-05	4.45E-05	5.37E-05
1950	1.02E-04	6.78E-05	4.31E-05	5.49E-05
1980	1.02E-04	6.47E-05	4.23E-05	5.45E-05
2010	1.01E-04	5.88E-05	4.15E-05	5.63E-05
2040	1.01E-04	6.87E-05	4.07E-05	5.91E-05
2070	1.01E-04	7.77E-05	3.98E-05	5.38E-05
2100	1.01E-04	7.67E-05	3.90E-05	5.32E-05
2130	1.01E-04	7.68E-05	3.82E-05	4.76E-05
2160	1.01E-04	7.89E-05	3.74E-05	4.19E-05
2190	1.01E-04	7.37E-05	3.65E-05	4.63E-05
2220	1.03E-04	7.42E-05	3.57E-05	4.48E-05
2250	9.87E-05	7.42E-05	3.49E-05	3.85E-05
2280	9.93E-05	7.41E-05	4.13E-05	3.90E-05
2310	9.52E-05	7.41E-05	4.38E-05	3.81E-05
2340	9.68E-05	7.40E-05	4.01E-05	4.04E-05
2370	8.99E-05	7.00E-05	4.31E-05	4.22E-05
2400	8.68E-05	6.72E-05	4.09E-05	4.21E-05
2430	8.85E-05	6.65E-05	3.73E-05	4.34E-05
2460	8.64E-05	6.48E-05	4.12E-05	4.72E-05
2490	8.17E-05	6.22E-05	3.75E-05	4.84E-05
2520	8.16E-05	6.53E-05	3.68E-05	4.96E-05
2550	9.07E-05	6.73E-05	3.62E-05	5.00E-05
2580	8.22E-05	6.72E-05	3.67E-05	4.92E-05
2610	8.08E-05	6.71E-05	3.57E-05	4.52E-05
2640	8.77E-05	6.70E-05	3.46E-05	4.09E-05
2670	7.75E-05	6.69E-05	3.49E-05	3.72E-05
2700	7.47E-05	6.69E-05	3.52E-05	3.82E-05
2730	7.18E-05	6.68E-05	3.47E-05	3.62E-05
2760	7.48E-05	6.67E-05	3.45E-05	3.65E-05
2790	7.77E-05	6.66E-05	3.45E-05	3.60E-05
2820	8.07E-05	6.65E-05	3.43E-05	3.62E-05
2850	8.05E-05	6.65E-05	3.27E-05	3.91E-05
2880	8.03E-05	6.64E-05	3.28E-05	3.81E-05
2910	8.01E-05	6.21E-05	3.30E-05	3.57E-05
2940	7.99E-05	6.06E-05	3.31E-05	3.63E-05
2970	7.97E-05	6.10E-05	3.33E-05	3.62E-05
3000	7.95E-05	5.97E-05	3.34E-05	3.61E-05

FLIGHT NO. C-434
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6483 DATE 03/29/79)
DATE 21878 FLIGHT NO. C-434 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	7.93E-05	5.94E-05	3.36E-05	3.54E-05
3060	7.91E-05	6.25E-05	3.38E-05	3.48E-05
3090	7.89E-05	5.82E-05	3.39E-05	3.50E-05
3120	7.87E-05	5.94E-05	3.41E-05	3.67E-05
3150	7.85E-05	5.97E-05	3.52E-05	3.46E-05
3180	7.84E-05	5.92E-05	3.22E-05	3.81E-05
3210	7.73E-05	5.87E-05	3.21E-05	3.48E-05
3240	7.72E-05	5.78E-05	3.43E-05	3.71E-05
3270	7.66E-05	5.80E-05	3.39E-05	3.60E-05
3300	7.61E-05	5.82E-05	3.20E-05	3.58E-05
3330	7.80E-05	5.84E-05	3.34E-05	3.64E-05
3360	7.54E-05	5.87E-05	2.85E-05	3.69E-05
3390	6.92E-05	5.89E-05	3.28E-05	3.54E-05
3420	7.45E-05	5.91E-05	3.43E-05	3.54E-05
3450	7.86E-05	5.93E-05	3.11E-05	3.54E-05
3480	6.46E-05	5.96E-05	3.57E-05	3.58E-05
3510	7.44E-05	5.98E-05	3.32E-05	3.62E-05
3540	7.33E-05	6.00E-05	3.39E-05	3.66E-05
3570	7.64E-05	6.02E-05	3.34E-05	3.64E-05
3600	7.16E-05	6.07E-05	3.43E-05	3.77E-05
3630	6.67E-05	6.02E-05	3.36E-05	3.82E-05
3660	6.74E-05	5.95E-05	3.36E-05	3.88E-05
3690	6.83E-05	6.10E-05	3.35E-05	3.68E-05
3720	6.92E-05	6.10E-05	3.33E-05	3.62E-05
3750	7.01E-05	6.10E-05	3.36E-05	3.65E-05
3780	7.09E-05	6.20E-05	3.39E-05	3.69E-05
3810	7.18E-05	6.11E-05	3.43E-05	3.63E-05
3840	7.27E-05	6.24E-05	3.46E-05	3.57E-05
3870	7.35E-05	6.11E-05	3.49E-05	3.60E-05
3900	7.44E-05	6.04E-05	3.52E-05	3.55E-05
3930	7.53E-05	5.90E-05	3.55E-05	3.38E-05
3960	7.61E-05	5.97E-05	3.58E-05	3.56E-05
3990	7.52E-05	6.03E-05	3.61E-05	3.56E-05
4020	7.49E-05	6.05E-05	3.50E-05	3.59E-05
4050	7.44E-05	6.02E-05	3.36E-05	3.66E-05
4080	7.57E-05	5.96E-05	3.30E-05	3.48E-05
4110	7.34E-05	6.12E-05	3.32E-05	3.55E-05
4140	7.52E-05	5.72E-05	3.04E-05	3.52E-05
4170	7.04E-05	5.55E-05	3.45E-05	3.56E-05
4200	7.44E-05	5.57E-05	3.56E-05	3.61E-05
4230	7.15E-05	5.59E-05	3.42E-05	3.65E-05
4260	7.66E-05	5.61E-05	3.27E-05	3.60E-05
4290	7.13E-05	5.63E-05	3.35E-05	3.46E-05
4320	7.21E-05	5.65E-05	3.23E-05	3.45E-05
4350	6.84E-05	5.67E-05	3.30E-05	3.44E-05
4380	6.82E-05	5.68E-05	3.39E-05	3.45E-05
4410	6.79E-05	5.70E-05	3.49E-05	3.28E-05
4440	6.76E-05	5.72E-05	3.41E-05	3.39E-05
4470	6.73E-05	5.74E-05	3.34E-05	3.35E-05
4500	6.70E-05	5.76E-05	3.26E-05	3.52E-05

FLIGHT NO. C-434
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6483 DATE 03/29/79)
DATE 21878 FLIGHT NO. C-434 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
4530	6.67E-05	5.78E-05	3.34E-05	3.54E-05
4560	6.65E-05	5.80E-05	3.39E-05	3.44E-05
4590	6.62E-05	5.82E-05	3.25E-05	3.52E-05
4620	6.59E-05	5.84E-05	3.20E-05	3.59E-05
4650	6.56E-05	5.88E-05	3.15E-05	3.38E-05
4680	7.38E-05	5.78E-05	3.10E-05	3.40E-05
4710	7.27E-05	5.70E-05	3.05E-05	3.42E-05
4740	7.23E-05	5.94E-05	3.00E-05	3.44E-05
4770	7.52E-05	5.86E-05	2.95E-05	3.46E-05
4800	7.32E-05	5.54E-05	2.90E-05	3.49E-05
4830	7.12E-05	5.83E-05	2.85E-05	3.44E-05
4860	6.89E-05	5.45E-05	2.98E-05	3.39E-05
4890	6.85E-05	5.76E-05	3.11E-05	3.63E-05
4920	6.82E-05	5.73E-05	2.97E-05	3.53E-05
4950	6.71E-05	5.69E-05	3.28E-05	3.61E-05
4980	6.73E-05	5.65E-05	3.15E-05	3.43E-05
5010	6.55E-05	5.84E-05	2.38E-05	3.35E-05
5040	6.56E-05	5.49E-05	3.05E-05	3.64E-05
5070	6.58E-05	5.50E-05	2.92E-05	3.50E-05
5100	6.59E-05	5.51E-05	3.43E-05	3.50E-05
5130	6.60E-05	5.51E-05	3.00E-05	3.51E-05
5160	6.62E-05	5.52E-05	3.10E-05	3.59E-05
5190	6.63E-05	5.53E-05	3.14E-05	3.26E-05
5220	6.65E-05	5.54E-05	3.01E-05	3.35E-05
5250	6.66E-05	5.55E-05	2.89E-05	3.48E-05
5280	6.67E-05	5.56E-05	3.00E-05	3.70E-05
5310	6.69E-05	5.57E-05	3.08E-05	3.63E-05
5340	6.70E-05	5.57E-05	3.11E-05	3.56E-05
5370	6.71E-05	5.58E-05	3.13E-05	3.48E-05
5400	6.73E-05	5.58E-05	3.11E-05	3.48E-05
5430	6.74E-05	5.32E-05	2.92E-05	3.48E-05
5460	6.76E-05	5.52E-05	2.72E-05	3.47E-05
5490	6.77E-05	5.48E-05	2.76E-05	3.45E-05
5520	6.50E-05	5.45E-05	2.80E-05	3.49E-05
5550	6.79E-05	5.44E-05	2.84E-05	3.35E-05
5580	6.50E-05	5.39E-05	2.89E-05	3.44E-05
5610	6.50E-05	5.35E-05	2.93E-05	3.54E-05
5640	5.95E-05	5.32E-05	2.97E-05	3.64E-05
5670	6.25E-05	5.40E-05	3.01E-05	3.43E-05
5700	6.60E-05	5.40E-05	3.05E-05	3.41E-05
5730	6.60E-05	5.40E-05	3.10E-05	3.37E-05
5760	6.60E-05	5.41E-05	3.14E-05	3.42E-05
5790	6.59E-05	5.41E-05	3.12E-05	3.46E-05
5820	6.58E-05	5.42E-05	2.76E-05	3.09E-05
5850	6.57E-05	5.42E-05	2.90E-05	3.23E-05
5880	6.57E-05	5.43E-05	2.90E-05	3.29E-05
5910	6.56E-05	5.43E-05	2.89E-05	3.35E-05
5940	6.55E-05	5.44E-05	2.88E-05	3.34E-05
5970	6.54E-05	5.45E-05	3.04E-05	3.41E-05
6000	6.54E-05	5.45E-05	2.90E-05	3.66E-05

FLIGHT NO. C-434
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6483 DATE 03/29/79)
DATE 21878 FLIGHT NO. C-434 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
6030	6.53E-05	5.46E-05	2.67E-05	3.32E-05
6060	6.52E-05	5.46E-05	2.91E-05	3.38E-05
6090	6.43E-05	5.47E-05	(2.91E-05)	(3.37E-05)
6120	6.48E-05	(5.46E-05)	(2.90E-05)	(3.36E-05)
6150	(6.46E-05)	(5.44E-05)	(2.89E-05)	(3.35E-05)
6180	(6.44E-05)	(5.42E-05)	(2.88E-05)	(3.34E-05)
6210	(6.42E-05)	(5.40E-05)	(2.87E-05)	(3.33E-05)
6240	(6.40E-05)	(5.39E-05)	(2.86E-05)	(3.31E-05)
6270	(6.38E-05)	(5.37E-05)	(2.85E-05)	(3.30E-05)
6300	(6.36E-05)	(5.35E-05)	(2.84E-05)	(3.29E-05)
FIRST DATA ALT	150	120	180	180
LAST DATA ALT	6120	6090	6060	6060

FLIGHT NO. C-434
EQUIVALENT ATTENUATION LENGTH

(JOB 6483 DATE 03/29/79)
DATE 21878 FLIGHT NO. C-434 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(6.55E 03)	(7.19E 03)	(1.68E 04)	(1.18E 04)
300	6.94E 03	7.91E 03	1.59E 04	1.24E 04
600	7.45E 03	8.87E 03	1.48E 04	1.41E 04
900	7.82E 03	9.52E 03	1.47E 04	1.47E 04
1200	7.97E 03	1.01E 04	1.54E 04	1.51E 04
1500	8.08E 03	1.06E 04	1.61E 04	1.54E 04
1800	8.31E 03	1.09E 04	1.69E 04	1.59E 04
2100	8.50E 03	1.13E 04	1.76E 04	1.62E 04
2400	8.68E 03	1.15E 04	1.83E 04	1.68E 04
2700	8.95E 03	1.19E 04	1.90E 04	1.73E 04
3000	9.23E 03	1.21E 04	1.97E 04	1.79E 04
3300	9.47E 03	1.25E 04	2.03E 04	1.85E 04
3600	9.71E 03	1.27E 04	2.09E 04	1.91E 04
3900	9.95E 03	1.30E 04	2.13E 04	1.95E 04
4200	1.01E 04	1.32E 04	2.18E 04	1.99E 04
4500	1.03E 04	1.34E 04	2.22E 04	2.04E 04
4800	1.05E 04	1.36E 04	2.26E 04	2.07E 04
5100	1.07E 04	1.38E 04	2.30E 04	2.11E 04
5400	1.09E 04	1.40E 04	2.34E 04	2.14E 04
5700	1.10E 04	1.41E 04	2.38E 04	2.17E 04
6000	1.12E 04	1.43E 04	2.42E 04	2.20E 04
6300	(1.13E 04)	(1.45E 04)	(2.45E 04)	(2.23E 04)

FLIGHT NO. C-434
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

$\tau_{R_1} = 0.090$

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.58E-01	9.63E-01	9.81E-01	9.76E-01
600	9.23E-01	9.35E-01	9.60E-01	9.58E-01
900	8.91E-01	9.10E-01	9.41E-01	9.41E-01
1200	8.60E-01	8.88E-01	9.25E-01	9.24E-01
1500	8.30E-01	8.68E-01	9.11E-01	9.07E-01
1800	8.05E-01	8.47E-01	8.99E-01	8.93E-01
2100	7.81E-01	8.31E-01	8.87E-01	8.78E-01
2400	7.58E-01	8.12E-01	8.77E-01	8.67E-01
2700	7.40E-01	7.96E-01	8.67E-01	8.55E-01
3000	7.22E-01	7.81E-01	8.59E-01	8.46E-01
3300	7.06E-01	7.67E-01	8.50E-01	8.37E-01
3600	6.90E-01	7.54E-01	8.42E-01	8.28E-01
3900	6.76E-01	7.40E-01	8.33E-01	8.19E-01
4200	6.61E-01	7.27E-01	8.25E-01	8.10E-01
4500	6.47E-01	7.15E-01	8.16E-01	8.02E-01
4800	6.34E-01	7.02E-01	8.09E-01	7.93E-01
5100	6.21E-01	6.91E-01	8.01E-01	7.85E-01
5400	6.09E-01	6.79E-01	7.94E-01	7.77E-01
5700	5.97E-01	6.68E-01	7.87E-01	7.69E-01
6000	5.85E-01	6.58E-01	7.80E-01	7.61E-01
6300	(5.74E-01)	(6.47E-01)	(7.73E-01)	(7.54E-01)

FLIGHT C-435 - 23 FEBRUARY 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	0832	0921	0.82	71.0	-	65.2	2310	762
4,5	0927	1015	0.80	64.8	-	60.9	2280	762

Flight Description. Flight C-435 was a morning flight with take off at 0800 and landing at 1045 GMT. There were overcast altostratus clouds. The approximate west to east Birkhof track in southwest Germany was over a plateau surrounded by forest and some small villages. Typical terrain features were forest cover with intermittent snow covered fields and valleys that presented a black and white contrast.

In-Flight Notes. The in-flight observer reported overcast altostratus with the flight conducted under the cloud layer. There were foehn conditions and it was very clear below the cloud layer. On the V-PRO's there was very uniform light haze and thin fog in the valleys. Slant visibilities were usually 48 kilometers (30 miles) except at 0938 GMT at 1200 kilometers (4000 feet) it was 32 kilometers (20 miles) and at 0955 GMT at 3000 meters (10,000 feet) it lowered to 24 kilometers (15 miles).

Local Weather Notes. Freudenstad, 53 kilometers west of the track center, reported varying amounts of cumulus from 2/8 to 6/8 at 720 to 780 meters (2400 to 2600 feet) and 8/8 to 7/8 altocumulus at 3000 meters (10,000 feet). Visibility was 30 to 40 kilometers.

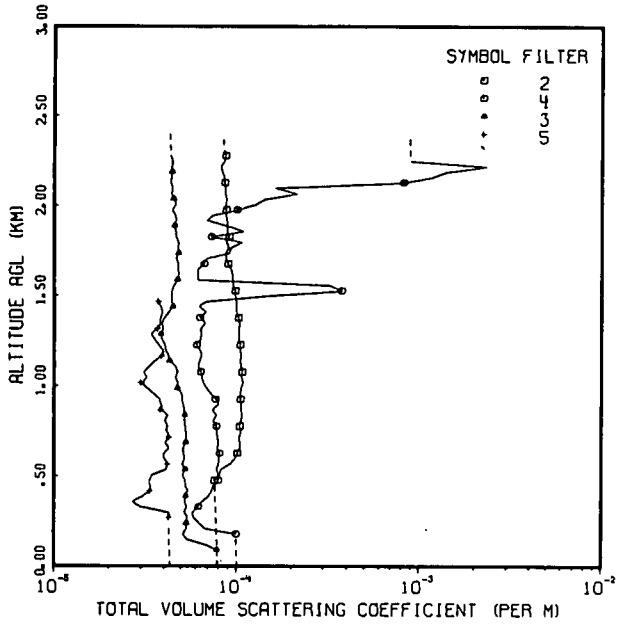
Spaichinger, 28 kilometers southwest of the track center, reported 1/8 to 3/8 cumulus at 1050 meters (3500 feet), 5/8 to 8/8 altocumulus at 2700 to 3300 meters (9000 to 11,000 feet) and 7/8 cirrus at 6000 meters (20,000 feet). Visibility was 70 to 75 kilometers.

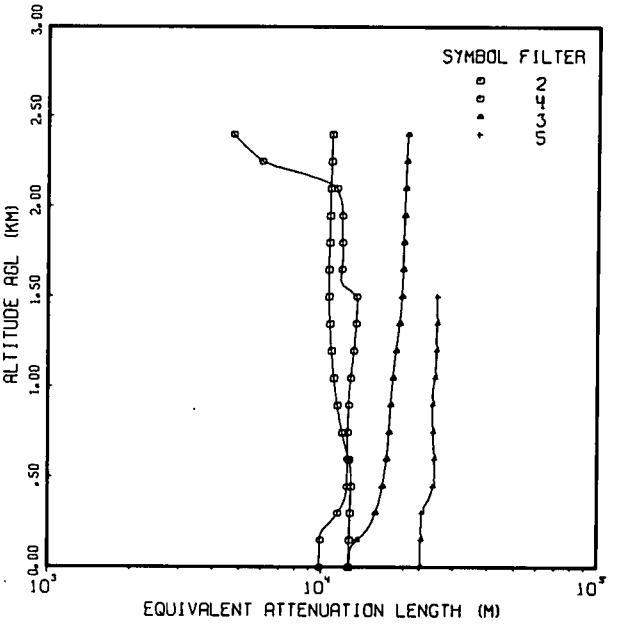
Ulm, 68 kilometers eastnortheast of the track center, reported ceiling zero, visibility zero in fog until 1100 GMT when conditions improved to 7/8 stratus at 210 meters (700 feet) and visibility 1.0 kilometers in fog.

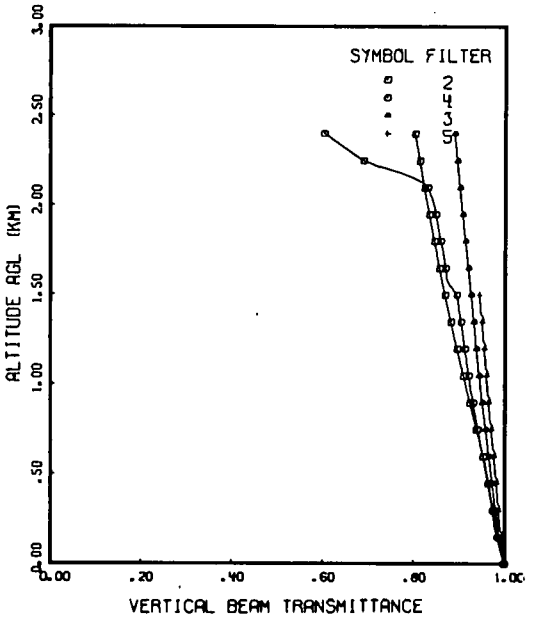
The radiosonde station at Neuchatel was 225 kilometers southwest and upstream from the track. The vertical cross section for 1200 GMT showed 8/8 clouds at 1300 meters, 7/8 at 2000 meters, 6/8 from 3000 to 4400 meters, 8/8 coverage from 5500 to 6500 meters and 5/8 cloud at 800 meters. These conditions also prevailed to the east and west.

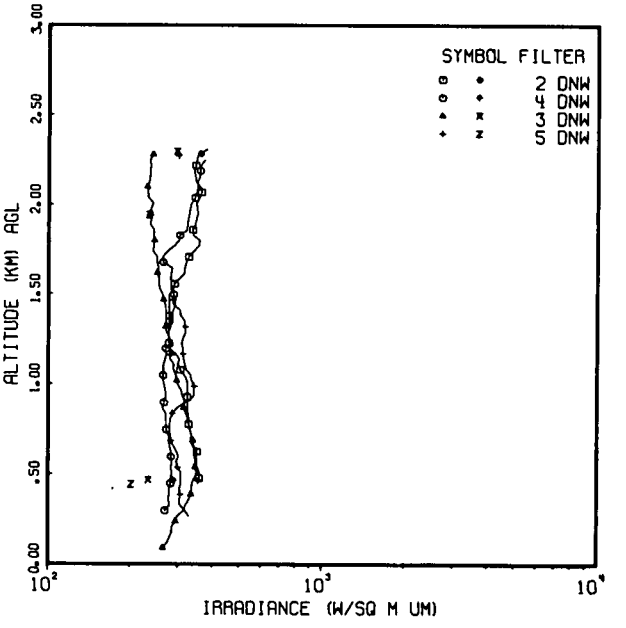
Synoptic Remarks. The surface charts showed an occlusion south of Iceland that extended east and southeast through western France and eastern Spain into Africa and then westward to another storm in the eastern Atlantic. This chart had widespread fog that was advected by southwesterly flow from the Mediterranean in advance of the frontal system in Europe. The 500 millibars chart showed ridging from Tunisia and eastern Algeria northward through western Germany to the North Sea. The upper flow was southwesterly and the air mass was stable maritime polar.

FLIGHT NO. C-435
BIRKHOF









FLIGHT NO. C-435
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6496 DATE 03/29/79)
DATE 22578 FLIGHT NO. C-435 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(7.95E-05)	(1.02E-04)	(7.88E-05)	(4.36E-05)
30	(7.91E-05)	(1.01E-04)	(7.84E-05)	(4.34E-05)
60	(7.89E-05)	(1.01E-04)	(7.82E-05)	(4.33E-05)
90	(7.87E-05)	(1.01E-04)	7.80E-05	(4.32E-05)
120	(7.85E-05)	(1.00E-04)	6.80E-05	(4.31E-05)
150	(7.83E-05)	(1.00E-04)	5.40E-05	(4.30E-05)
180	(7.81E-05)	9.98E-05	5.11E-05	(4.29E-05)
210	(7.79E-05)	6.77E-05	5.33E-05	(4.27E-05)
240	(7.77E-05)	6.22E-05	5.31E-05	(4.26E-05)
270	(7.75E-05)	5.82E-05	5.42E-05	4.25E-05
300	(7.73E-05)	5.77E-05	5.14E-05	4.22E-05
330	(7.71E-05)	6.18E-05	5.35E-05	3.00E-05
360	(7.69E-05)	6.47E-05	5.21E-05	2.68E-05
390	(7.67E-05)	7.06E-05	5.26E-05	3.05E-05
420	(7.65E-05)	7.32E-05	5.41E-05	3.35E-05
450	(7.63E-05)	7.50E-05	5.20E-05	3.34E-05
480	7.61E-05	7.99E-05	5.27E-05	3.34E-05
510	8.11E-05	8.01E-05	5.08E-05	3.46E-05
540	8.26E-05	7.81E-05	5.23E-05	4.12E-05
570	9.20E-05	8.01E-05	5.07E-05	4.19E-05
600	9.83E-05	8.09E-05	5.22E-05	3.99E-05
630	1.02E-04	8.11E-05	5.14E-05	4.02E-05
660	1.05E-04	7.89E-05	5.12E-05	4.27E-05
690	1.05E-04	8.04E-05	5.27E-05	4.01E-05
720	1.04E-04	7.87E-05	5.34E-05	4.26E-05
750	1.06E-04	7.85E-05	5.30E-05	4.13E-05
780	1.04E-04	7.78E-05	5.26E-05	4.21E-05
810	1.06E-04	7.51E-05	5.20E-05	4.01E-05
840	1.08E-04	7.79E-05	5.20E-05	4.21E-05
870	1.07E-04	7.31E-05	5.21E-05	3.84E-05
900	1.06E-04	7.99E-05	5.12E-05	3.85E-05
930	1.05E-04	7.69E-05	5.05E-05	3.81E-05
960	1.06E-04	7.21E-05	5.03E-05	3.49E-05
990	1.06E-04	6.84E-05	4.73E-05	3.25E-05
1020	1.09E-04	6.55E-05	4.79E-05	3.00E-05
1050	1.07E-04	6.42E-05	4.64E-05	3.23E-05
1080	1.07E-04	6.36E-05	4.78E-05	3.11E-05
1110	1.06E-04	6.18E-05	4.60E-05	3.34E-05
1140	1.05E-04	6.29E-05	4.29E-05	3.56E-05
1170	1.06E-04	6.43E-05	4.25E-05	3.89E-05
1200	1.05E-04	6.31E-05	4.09E-05	3.95E-05
1230	1.05E-04	6.03E-05	4.05E-05	3.74E-05
1260	1.03E-04	6.37E-05	3.91E-05	3.56E-05
1290	1.03E-04	6.39E-05	3.83E-05	3.41E-05
1320	1.04E-04	6.39E-05	3.98E-05	3.68E-05
1350	1.04E-04	6.75E-05	3.89E-05	3.81E-05
1380	1.02E-04	6.32E-05	4.02E-05	3.85E-05
1410	1.00E-04	6.79E-05	4.24E-05	3.94E-05
1440	9.98E-05	6.16E-05	4.47E-05	3.87E-05
1470	9.95E-05	6.88E-05	4.42E-05	3.73E-05
1500	9.83E-05	(1.40E-04)	4.45E-05	(3.72E-05)

FLIGHT NO. C-435
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6496 DATE 03/29/79)
DATE 22378 FLIGHT NO. C-435 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	9.79E-05	3.77E-04	4.43E-05	
1560	9.55E-05	3.22E-04	4.55E-05	
1590	9.52E-05	6.14E-05	4.72E-05	
1620	9.48E-05	6.15E-05	4.84E-05	
1650	9.32E-05	6.15E-05	4.77E-05	
1680	8.94E-05	6.65E-05	4.81E-05	
1710	8.73E-05	6.86E-05	4.67E-05	
1740	8.72E-05	8.99E-05	4.78E-05	
1770	9.03E-05	9.32E-05	4.80E-05	
1800	8.69E-05	1.07E-04	4.82E-05	
1830	9.06E-05	7.26E-05	4.66E-05	
1860	8.83E-05	1.09E-04	4.64E-05	
1890	8.91E-05	8.87E-05	4.54E-05	
1920	8.83E-05	6.87E-05	4.67E-05	
1950	8.74E-05	7.39E-05	4.60E-05	
1980	8.74E-05	1.00E-04	4.45E-05	
2010	8.74E-05	1.27E-04	4.64E-05	
2040	8.80E-05	1.43E-04	4.50E-05	
2070	8.64E-05	2.13E-04	4.39E-05	
2100	8.64E-05	1.63E-04	4.45E-05	
2130	8.56E-05	8.20E-04	4.34E-05	
2160	8.52E-05	1.18E-03	4.39E-05	
2190	8.33E-05	1.42E-03	4.40E-05	
2220	8.16E-05	2.33E-03	4.41E-05	
— 2250	8.57E-05	9.03E-04	4.45E-05	
2280	8.65E-05	(9.00E-04)	4.33E-05	
2310	8.52E-05	(8.97E-04)	(4.31E-05)	
2340	(8.49E-05)	(8.95E-04)	(4.30E-05)	
2370	(8.47E-05)	(8.92E-04)	(4.29E-05)	
2400	(8.44E-05)	(8.89E-04)	(4.27E-05)	
FIRST DATA ALT	480	180	90	270
LAST DATA ALT	2310	2250	2280	1470

FLIGHT NO. C-435
EQUIVALENT ATTENUATION LENGTH

(JOB 6496 DATE 03/29/79)
DATE 22578 FLIGHT NO. C-435 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(1.26E 04)	(9.84E 03)	(1.27E 04)	(2.29E 04)
300	(1.28E 04)	1.15E 04	1.58E 04	2.33E 04
600	1.26E 04	1.25E 04	1.73E 04	2.58E 04
900	1.14E 04	1.26E 04	1.79E 04	2.53E 04
1200	1.08E 04	1.31E 04	1.86E 04	2.61E 04
1500	1.06E 04	1.34E 04	1.96E 04	(2.63E 04)
1800	1.06E 04	1.18E 04	1.98E 04	
2100	1.07E 04	1.13E 04	2.01E 04	
2400	(1.09E 04)	(4.72E 03)	(2.04E 04)	

FLIGHT NO. C-435
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

$\tau_R = 0.0282$

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.77E-01	9.74E-01	9.81E-01	9.87E-01
600	9.54E-01	9.53E-01	9.66E-01	9.77E-01
900	9.24E-01	9.31E-01	9.51E-01	9.65E-01
1200	8.95E-01	9.12E-01	9.38E-01	9.55E-01
1500	8.68E-01	8.94E-01	9.26E-01	(9.44E-01)
1800	8.44E-01	8.59E-01	9.13E-01	
2100	8.22E-01	8.30E-01	9.01E-01	
2400	(8.02E-01)	(8.01E-01)	(8.89E-01)	

FLIGHT C-436 - 23 FEBRUARY 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	1322	1403	0.68	62.5	-	66.5	2100	762
4,5	1412	1452	0.67	67.4	-	72.2	1770	762

Flight Description. Flight C-436 was an afternoon flight with take off at 1255 and landing at 1530 GMT. There were overcast clouds. The approximate west to east Birkhof track in southwest Germany was over a plateau surrounded by forest and some small villages. Typical terrain features were forest cover with intermittent snow covered fields and valleys that presented a black and white contrast.

In-Flight Notes. The in-flight observer reported that cloud bases were more diffuse than for the morning flight. There were some bright spots and the fog in the valleys had depth. Overcast altostratus bases were 2900 to 3000 meters (9500 to 10,000 feet) and there were virga in mid track. Slant range visibility was 24 kilometers (15 miles) with light haze.

Local Weather Notes. Freudenstad, 53 kilometers west of the track center, reported 3/8 to 5/8 stratocumulus at heights varying from 750 to 1200 meters (2500 to 4000 feet), 6/8 to 8/8 altocumulus at 2700 meters (9000 feet) and 7/8 cirrus at 7200 meters (24,000 feet). Visibility was 45 kilometers.

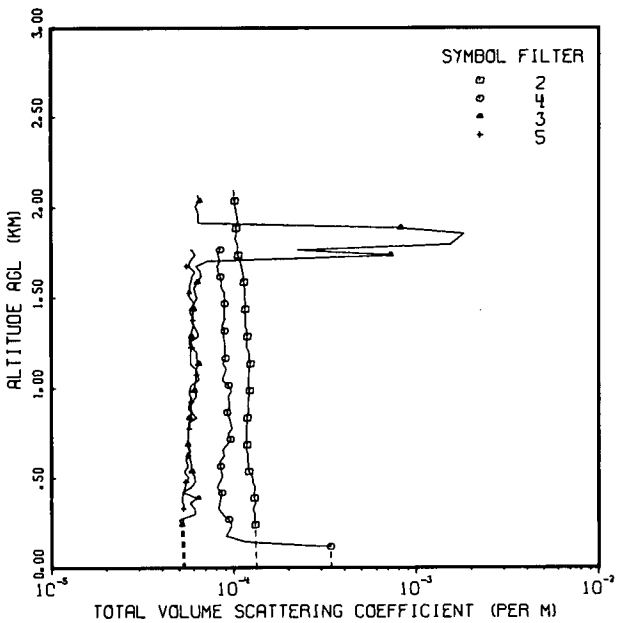
Spaichinger, 28 kilometers southwest of the flight track center, reported 4/8 cumulus at 1050 meters (3500 feet), 7/8 altocumulus at 3000 meters (10,000 feet) and 8/8 cirrostratus at 6000 meters (20,000 feet) at 1300 GMT. By 1600 GMT the conditions were 2/8 cumulus at 1050 meters (3500 feet) and 8/8 altocumulus at 2400 meters (8000 feet). Visibility was 60 kilometers throughout the period.

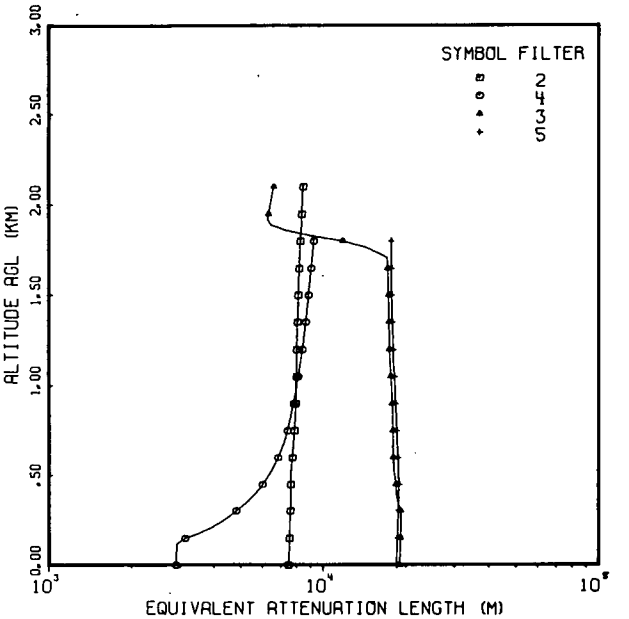
Ulm, 68 kilometers eastnortheast of the flight track center, reported 2/8 stratocumulus at 450 meters (1500 feet) and 8/8 cirrus at 6900 meters (23,000 feet) at the beginning of the flight. The stratocumulus bases improved by 1400 GMT to 1200 meters (4000 feet) with amounts varying from 3/8 to 5/8 and 7/8 to 8/8 altostratus at 2700 meters (9000 feet). Visibility was 4.5 to 5.0 kilometers in haze.

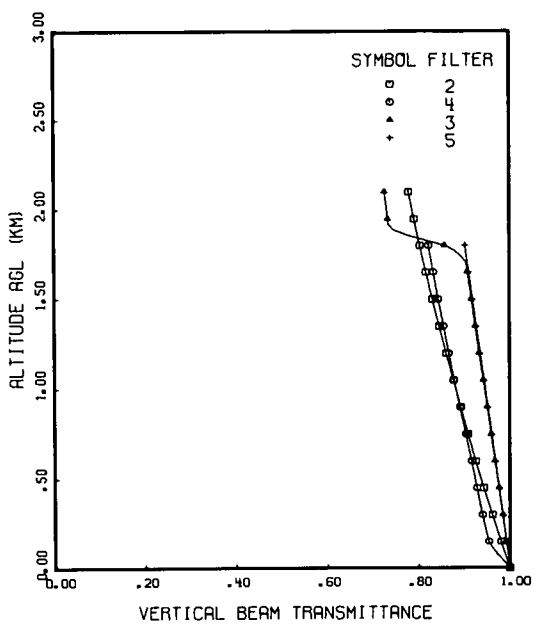
The radiosonde station at Neuchatel was 225 kilometers southwest and upstream from the track. The vertical cross section for 1200 GMT showed 8/8 clouds at 1300 meters, 7/8 at 2000 meters, 6/8 from 3000 to 4400 meters, 8/8 coverage from 5500 to 6500 meters and 5/8 cloud at 8000 meters. These conditions also prevailed to the east and west.

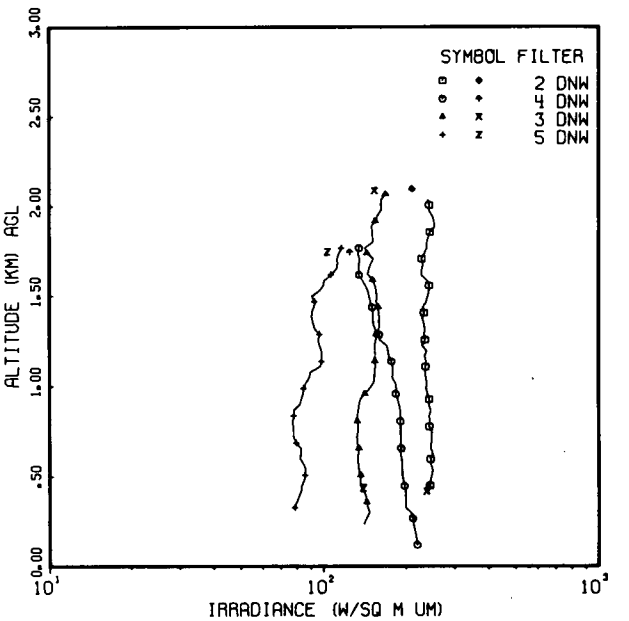
Synoptic Remarks. The surface charts showed an occlusion south of Iceland that extended east and southeast through western France and eastern Spain into Africa and then westward to another storm in the eastern Atlantic. This chart had widespread fog that was advected by southwesterly flow from the Mediterranean in advance of the frontal system in Europe. The 500 millibars chart showed ridging from Tunisia and eastern Algeria northward through western Germany to the North Sea. The upper flow was southwesterly and the air mass was stable maritime polar.

FLIGHT NO. C-436
BIRKHOF









FLIGHT NO. C-436
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6501 DATE 03/29/79)
DATE 22378 FLIGHT NO. C-436 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(1.34E-04)	(3.44E-04)	(5.27E-05)	(5.41E-05)
30	(1.33E-04)	(3.42E-04)	(5.24E-05)	(5.38E-05)
60	(1.33E-04)	(3.41E-04)	(5.23E-05)	(5.36E-05)
90	(1.32E-04)	(3.40E-04)	(5.22E-05)	(5.35E-05)
120	(1.32E-04)	3.39E-04	(5.21E-05)	(5.34E-05)
150	(1.32E-04)	1.14E-04	(5.19E-05)	(5.32E-05)
180	(1.31E-04)	9.10E-05	(5.18E-05)	(5.31E-05)
210	(1.31E-04)	9.44E-05	(5.17E-05)	(5.30E-05)
240	1.31E-04	9.71E-05	5.15E-05	(5.28E-05)
270	1.30E-04	9.36E-05	5.04E-05	(5.27E-05)
300	1.31E-04	8.67E-05	6.07E-05	(5.26E-05)
330	1.27E-04	8.30E-05	6.10E-05	5.24E-05
360	1.32E-04	8.37E-05	5.71E-05	5.22E-05
390	1.29E-04	8.49E-05	6.35E-05	5.24E-05
420	1.30E-04	8.61E-05	5.23E-05	5.26E-05
450	1.31E-04	8.14E-05	5.78E-05	5.41E-05
480	1.27E-04	8.40E-05	6.13E-05	5.45E-05
510	1.27E-04	8.66E-05	6.11E-05	5.63E-05
540	1.21E-04	8.56E-05	5.89E-05	5.36E-05
570	1.21E-04	8.46E-05	5.88E-05	5.63E-05
600	1.20E-04	8.45E-05	5.81E-05	5.46E-05
630	1.20E-04	8.89E-05	5.72E-05	5.59E-05
660	1.18E-04	8.63E-05	5.69E-05	5.76E-05
690	1.18E-04	9.21E-05	5.59E-05	5.64E-05
720	1.18E-04	9.60E-05	5.63E-05	5.62E-05
750	1.18E-04	9.29E-05	5.65E-05	5.64E-05
780	1.17E-04	9.79E-05	5.68E-05	5.67E-05
810	1.19E-04	9.57E-05	5.74E-05	5.63E-05
840	1.19E-04	9.49E-05	5.71E-05	6.26E-05
870	1.21E-04	9.22E-05	5.92E-05	5.77E-05
900	1.20E-04	9.47E-05	5.80E-05	5.67E-05
930	1.20E-04	9.43E-05	5.95E-05	5.81E-05
960	1.21E-04	9.37E-05	6.23E-05	5.75E-05
990	1.22E-04	9.72E-05	6.10E-05	5.75E-05
1020	1.21E-04	9.37E-05	6.14E-05	5.84E-05
1050	1.21E-04	8.66E-05	6.19E-05	6.42E-05
1080	1.21E-04	8.88E-05	6.25E-05	6.24E-05
1110	1.22E-04	9.10E-05	6.24E-05	6.18E-05
1140	1.23E-04	8.70E-05	6.42E-05	5.82E-05
1170	1.21E-04	9.01E-05	6.27E-05	5.83E-05
1200	1.22E-04	8.93E-05	6.32E-05	5.83E-05
1230	1.18E-04	8.98E-05	5.87E-05	5.88E-05
1260	1.19E-04	8.90E-05	5.72E-05	5.76E-05
1290	1.18E-04	8.81E-05	5.83E-05	6.40E-05
1320	1.18E-04	8.92E-05	5.91E-05	6.19E-05
1350	1.16E-04	8.67E-05	6.03E-05	6.08E-05
1380	1.17E-04	8.93E-05	5.93E-05	5.96E-05
1410	1.16E-04	8.91E-05	5.99E-05	5.83E-05
1440	1.15E-04	8.94E-05	6.03E-05	5.77E-05
1470	1.17E-04	8.91E-05	6.03E-05	6.08E-05
1500	1.15E-04	8.93E-05	6.29E-05	5.72E-05

FLIGHT NO. C-436
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6501 DATE 03/29/79)
DATE 22378 FLIGHT NO. C-436 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M)			
FILTERS	2	4	3	5
1530	1.15E-04	8.95E-05	6.12E-05	5.67E-05
1560	1.14E-04	8.55E-05	6.10E-05	5.73E-05
1590	1.14E-04	8.58E-05	6.30E-05	5.83E-05
1620	1.13E-04	8.45E-05	6.64E-05	5.90E-05
1650	1.12E-04	8.21E-05	6.51E-05	6.13E-05
1680	1.10E-04	8.15E-05	6.24E-05	5.53E-05
1710	1.08E-04	8.40E-05	7.23E-05	5.80E-05
1740	1.06E-04	8.16E-05	7.23E-04	6.12E-05
1770	1.05E-04	8.41E-05	2.24E-04	5.82E-05
1800	1.05E-04	(8.39E-05)	1.55E-03	(5.80E-05)
1830	1.02E-04		1.69E-03	
1860	1.04E-04		1.83E-03	
1890	1.03E-04		8.22E-04	
1920	1.06E-04		6.39E-05	
1950	1.04E-04		6.40E-05	
1980	1.04E-04		6.36E-05	
2010	1.02E-04		6.19E-05	
2040	1.01E-04		6.49E-05	
2070	(1.01E-04)		6.40E-05	
2100	(1.00E-04)		(6.38E-05)	
FIRST DATA ALT	240	120	240	330
LAST DATA ALT	2040	1770	2070	1770

FLIGHT NO. C-436
EQUIVALENT ATTENUATION LENGTH

(JOB 6501 DATE 03/29/79)
DATE 22578 FLIGHT NO. C-436 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(7.48E 03)	(2.91E 03)	(1.90E 04)	(1.85E 04)
300	7.59E 03	4.84E 03	1.91E 04	(1.88E 04)
600	7.73E 03	6.86E 03	1.79E 04	1.87E 04
900	7.95E 03	7.81E 03	1.78E 04	1.83E 04
1200	8.02E 03	8.41E 03	1.74E 04	1.79E 04
1500	8.12E 03	8.86E 03	1.72E 04	1.77E 04
1800	8.26E 03	(9.25E 03)	1.17E 04	(1.76E 04)
2100	(8.44E 03)		(6.58E 03)	

FLIGHT NO. C-436
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

$\tau_{R_1} = 0.0234$

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.61E-01	9.40E-01	9.84E-01	(9.84E-01)
600	9.25E-01	9.16E-01	9.67E-01	9.68E-01
900	8.93E-01	8.91E-01	9.51E-01	9.52E-01
1200	8.61E-01	8.67E-01	9.33E-01	9.35E-01
1500	8.31E-01	8.44E-01	9.17E-01	9.19E-01
1800	8.04E-01	(8.23E-01)	8.58E-01	(9.03E-01)
2100	(7.80E-01)		(7.27E-01)	

FLIGHT C-437 - 27 FEBRUARY 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	0925	1126	2.02	63.6	-	56.7	5160	762
4,5	1133	1326	1.88	56.6	56.6	61.6	5130	762

Flight Description. Flight C-437 was a midday flight spanning local apparent noon with take off at 0900 and landing at 1359 GMT. There were scattered to broken cirrus clouds. The approximate west to east Birkhof track in southwest Germany was over a plateau surrounded by forest and some small villages. Typical terrain features were forest cover with intermittent snow covered fields and valleys that presented a black and white contrast.

In-Flight Notes. The in-flight observer reported 3/8 to 4/8 cirrus that was thin at the start of flight increased in density and amount becoming 6/8 at 1135 GMT and overcast at 1310 GMT. Heavier cirrus moved in from the west at heights of 6000 meters (20,000 feet). There was fog in the valleys but the slant range visibility was unlimited.

Local Weather Notes. Freudenstad, 53 kilometers west of the track center, reported 5/8 to 6/8 cirrus at 6900 meters (23,000 feet) gradually lowering to 6300 meters (21,000 feet). 1/8 cumulus formed at 600 meters (2,000 feet) by noon. Visibility was 40 to 50 kilometers.

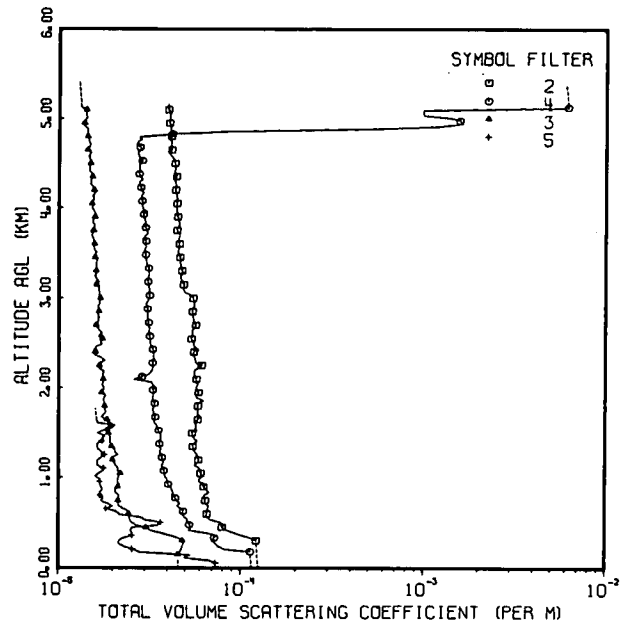
Spaichinger, 28 kilometers southwest of the track center, reported 6/8 to 7/8 cirrus at 6900 meters (23,000 feet) with 1/8 to 2/8 cumulus at 600 meters (2000 feet) after 1300 GMT. Visibility was observed as 70 to 75 kilometers.

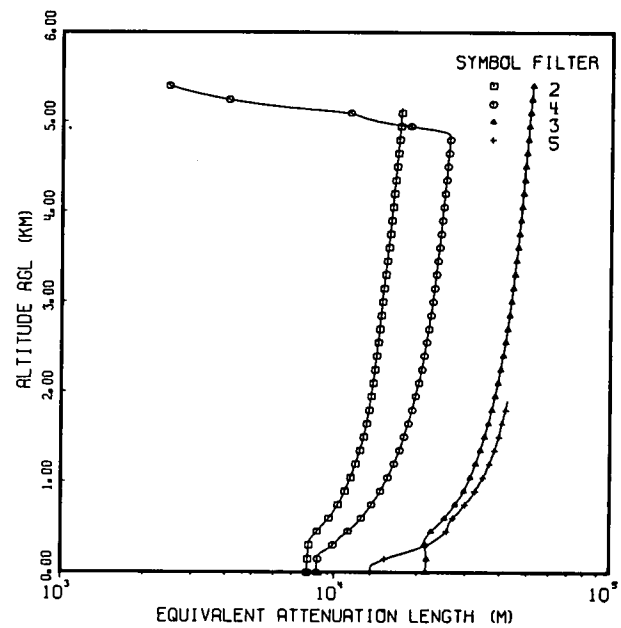
Ulm, 68 kilometers eastnortheast of the track center, had fog with a ceiling of 30 meters (100 feet) and visibility of 0.2 kilometers at 0900 GMT. Cirrus clouds gradually increased from 1/8 to 6/8 with bases at 6900 meters (23,000 feet) and visibilities gradually improved to 15 kilometers.

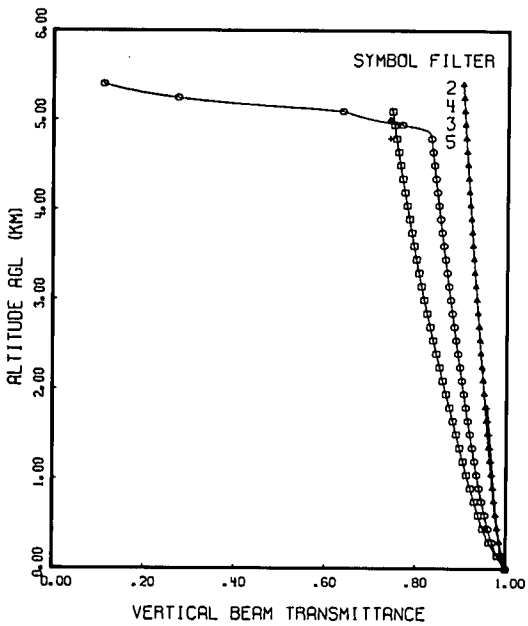
The radiosonde station at Neuchatel was 225 kilometers southwest and upstream from the track. The vertical cross section for 1200 GMT showed 6/8 cloud from 1400 to 2000 meters.

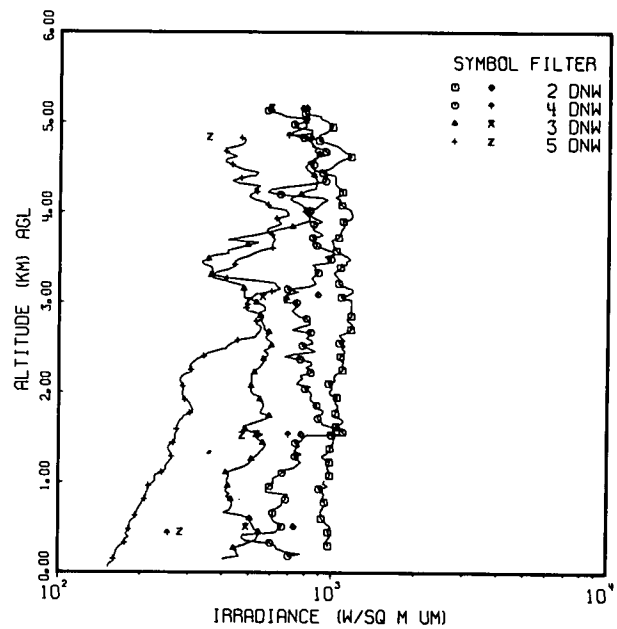
Synoptic Remarks. The surface chart had an occluded front off the east coast of Spain with a dissipating warm front from the southern Balearics to Algeria. The cold front part of this system extended from the Balearics southwest through Morocco into the Atlantic. The surface flow was southwesterly with widespread fog and stratus in advance of the occlusion. At 500 millibars there was a low in northeastern Yugoslavia with a minor trough from central West Germany to eastern Turkey. The upper flow was southwesterly and the air mass was modified stable maritime polar.

FLIGHT NO. C-437
BIRKHOF









FLIGHT NO. C-437
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6513 DATE 03/29/79)
DATE 22778 FLIGHT NO. C-437 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(1.25E-04)	(1.16E-04)	(4.62E-05)	(7.38E-05)
30	(1.25E-04)	(1.15E-04)	(4.60E-05)	(7.34E-05)
60	(1.25E-04)	(1.15E-04)	(4.59E-05)	7.32E-05
90	(1.24E-04)	(1.14E-04)	(4.58E-05)	6.74E-05
120	(1.24E-04)	(1.14E-04)	(4.57E-05)	4.95E-05
150	(1.24E-04)	(1.14E-04)	4.56E-05	5.34E-05
180	(1.23E-04)	1.14E-04	4.72E-05	2.81E-05
210	(1.23E-04)	8.19E-05	4.74E-05	2.56E-05
240	(1.23E-04)	7.55E-05	4.80E-05	2.31E-05
270	(1.22E-04)	7.34E-05	4.89E-05	2.16E-05
300	1.22E-04	7.00E-05	4.82E-05	2.17E-05
330	1.15E-04	7.21E-05	4.62E-05	2.26E-05
360	1.01E-04	7.48E-05	4.14E-05	2.55E-05
390	9.20E-05	6.48E-05	3.68E-05	2.53E-05
420	8.34E-05	5.22E-05	3.21E-05	2.51E-05
450	7.91E-05	5.39E-05	3.05E-05	2.57E-05
480	8.20E-05	5.26E-05	2.67E-05	3.53E-05
510	7.66E-05	5.13E-05	2.52E-05	3.66E-05
540	6.77E-05	5.14E-05	2.48E-05	3.00E-05
570	6.51E-05	4.91E-05	2.46E-05	2.81E-05
600	6.53E-05	4.80E-05	2.44E-05	2.17E-05
630	6.61E-05	4.85E-05	2.46E-05	2.09E-05
660	6.65E-05	4.69E-05	2.28E-05	1.83E-05
690	6.69E-05	4.50E-05	2.15E-05	1.99E-05
720	6.38E-05	4.66E-05	2.14E-05	1.86E-05
750	6.41E-05	4.47E-05	2.13E-05	1.72E-05
780	6.32E-05	4.39E-05	2.15E-05	1.77E-05
810	6.37E-05	4.20E-05	2.16E-05	1.70E-05
840	6.73E-05	4.29E-05	2.06E-05	1.70E-05
870	6.45E-05	4.20E-05	2.06E-05	1.75E-05
900	6.27E-05	4.13E-05	2.12E-05	1.72E-05
930	6.47E-05	4.01E-05	2.18E-05	1.69E-05
960	5.93E-05	3.98E-05	2.11E-05	1.69E-05
990	5.98E-05	3.94E-05	2.13E-05	1.68E-05
1020	6.19E-05	3.84E-05	2.15E-05	1.60E-05
1050	6.04E-05	3.84E-05	2.19E-05	1.68E-05
1080	6.00E-05	3.79E-05	2.11E-05	1.76E-05
1110	5.94E-05	3.75E-05	2.14E-05	1.77E-05
1140	5.58E-05	3.69E-05	2.06E-05	1.64E-05
1170	5.80E-05	3.77E-05	2.02E-05	1.65E-05
1200	5.87E-05	3.74E-05	1.98E-05	1.65E-05
1230	5.85E-05	3.71E-05	1.98E-05	1.72E-05
1260	5.77E-05	3.63E-05	2.13E-05	1.78E-05
1290	5.60E-05	3.62E-05	2.05E-05	1.72E-05
1320	5.51E-05	3.65E-05	2.03E-05	1.67E-05
1350	5.47E-05	3.62E-05	1.96E-05	1.65E-05
1380	5.56E-05	3.59E-05	1.94E-05	1.63E-05
1410	5.78E-05	3.63E-05	1.91E-05	1.73E-05
1440	5.52E-05	3.66E-05	1.93E-05	1.77E-05
1470	5.43E-05	3.66E-05	1.90E-05	1.80E-05
1500	5.41E-05	3.65E-05	1.88E-05	1.63E-05

FLIGHT NO. C-437
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6513 DATE 03/29/79)
DATE 22778 FLIGHT NO. C-437 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	5.75E-05	3.55E-05	1.81E-05	1.77E-05
1560	5.63E-05	3.46E-05	1.94E-05	1.90E-05
1590	5.70E-05	3.47E-05	2.05E-05	2.04E-05
1620	5.61E-05	3.36E-05	1.88E-05	1.64E-05
1650	5.82E-05	3.36E-05	1.85E-05	1.63E-05
1680	6.06E-05	3.41E-05	1.72E-05	1.62E-05
1710	5.81E-05	3.39E-05	1.79E-05	(1.61E-05)
1740	5.85E-05	3.33E-05	1.82E-05	(1.61E-05)
1770	5.83E-05	3.30E-05	1.79E-05	(1.60E-05)
1800	5.84E-05	3.37E-05	1.79E-05	(1.60E-05)
1830	5.54E-05	3.38E-05	1.79E-05	
1860	6.27E-05	3.23E-05	1.77E-05	
1890	5.74E-05	3.30E-05	1.79E-05	
1920	5.75E-05	3.32E-05	1.83E-05	
1950	5.88E-05	3.35E-05	1.73E-05	
1980	5.74E-05	3.30E-05	1.78E-05	
2010	5.70E-05	3.43E-05	1.78E-05	
2040	5.84E-05	3.25E-05	1.74E-05	
2070	5.89E-05	3.23E-05	1.78E-05	
2100	5.71E-05	2.59E-05	1.76E-05	
2130	5.62E-05	2.87E-05	1.75E-05	
2160	5.57E-05	3.15E-05	1.75E-05	
2190	5.55E-05	3.24E-05	1.79E-05	
2220	5.83E-05	3.29E-05	1.67E-05	
2250	6.10E-05	3.29E-05	1.68E-05	
2280	5.64E-05	3.29E-05	1.69E-05	
2310	5.66E-05	3.37E-05	1.80E-05	
2340	5.57E-05	3.31E-05	1.70E-05	
2370	5.44E-05	3.32E-05	1.58E-05	
2400	5.50E-05	3.33E-05	1.60E-05	
2430	5.85E-05	3.28E-05	1.58E-05	
2460	5.51E-05	3.27E-05	1.62E-05	
2490	5.50E-05	3.18E-05	1.73E-05	
2520	5.50E-05	3.20E-05	1.70E-05	
2550	5.36E-05	3.17E-05	1.74E-05	
2580	5.44E-05	3.16E-05	1.65E-05	
2610	5.44E-05	3.15E-05	1.74E-05	
2640	5.38E-05	3.13E-05	1.67E-05	
2670	5.55E-05	3.16E-05	1.63E-05	
2700	5.65E-05	3.09E-05	1.60E-05	
2730	5.49E-05	3.12E-05	1.64E-05	
2760	5.54E-05	3.13E-05	1.65E-05	
2790	5.47E-05	3.07E-05	1.66E-05	
2820	5.43E-05	3.07E-05	1.63E-05	
2850	5.42E-05	3.07E-05	1.66E-05	
2880	5.41E-05	3.07E-05	1.66E-05	
2910	5.56E-05	3.08E-05	1.64E-05	
2940	5.54E-05	3.02E-05	1.68E-05	
2970	5.50E-05	3.10E-05	1.69E-05	
3000	5.46E-05	3.15E-05	1.70E-05	

FLIGHT NO. C-437
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6513 DATE 03/29/79)
DATE 22778 FLIGHT NO. C-437 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	5.42E-05	3.16E-05	1.67E-05	
3060	4.96E-05	3.17E-05	1.68E-05	
3090	4.84E-05	3.17E-05	1.67E-05	
3120	4.90E-05	3.14E-05	1.67E-05	
3150	4.85E-05	3.12E-05	1.61E-05	
3180	4.79E-05	3.10E-05	1.67E-05	
3210	4.70E-05	3.09E-05	1.61E-05	
3240	4.66E-05	3.13E-05	1.58E-05	
3270	4.82E-05	3.14E-05	1.62E-05	
3300	4.74E-05	3.13E-05	1.61E-05	
3330	4.66E-05	3.11E-05	1.61E-05	
3360	4.72E-05	3.09E-05	1.61E-05	
3390	4.62E-05	3.05E-05	1.62E-05	
3420	4.68E-05	3.05E-05	1.62E-05	
3450	4.62E-05	2.98E-05	1.58E-05	
3480	4.60E-05	3.00E-05	1.58E-05	
3510	4.52E-05	3.01E-05	1.62E-05	
3540	4.55E-05	2.95E-05	1.56E-05	
3570	4.58E-05	3.03E-05	1.56E-05	
3600	4.59E-05	2.98E-05	1.57E-05	
3630	4.53E-05	3.01E-05	1.55E-05	
3660	4.57E-05	2.89E-05	1.55E-05	
3690	4.62E-05	3.01E-05	1.52E-05	
3720	4.55E-05	3.09E-05	1.54E-05	
3750	4.44E-05	3.03E-05	1.55E-05	
3780	4.53E-05	3.00E-05	1.57E-05	
3810	4.58E-05	2.92E-05	1.58E-05	
3840	4.57E-05	3.01E-05	1.53E-05	
3870	4.52E-05	2.96E-05	1.56E-05	
3900	4.48E-05	2.92E-05	1.58E-05	
3930	4.48E-05	2.91E-05	1.61E-05	
3960	4.45E-05	3.07E-05	1.57E-05	
3990	4.43E-05	2.87E-05	1.53E-05	
4020	4.43E-05	2.86E-05	1.54E-05	
4050	4.44E-05	2.90E-05	1.52E-05	
4080	4.46E-05	2.86E-05	1.55E-05	
4110	4.47E-05	2.82E-05	1.55E-05	
4140	4.42E-05	2.84E-05	1.54E-05	
4170	4.37E-05	2.92E-05	1.60E-05	
4200	4.35E-05	2.82E-05	1.56E-05	
4230	4.40E-05	2.81E-05	1.56E-05	
4260	4.37E-05	2.76E-05	1.49E-05	
4290	4.33E-05	2.75E-05	1.51E-05	
4320	4.29E-05	2.89E-05	1.52E-05	
4350	4.40E-05	2.78E-05	1.53E-05	
4380	4.30E-05	2.75E-05	1.53E-05	
4410	4.31E-05	2.77E-05	1.47E-05	
4440	4.34E-05	2.79E-05	1.47E-05	
4470	4.32E-05	2.75E-05	1.48E-05	
4500	4.32E-05	2.76E-05	1.49E-05	

FLIGHT NO. C-437
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6513 DATE 03/29/79)
DATE 22778 FLIGHT NO. C-437 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
4530	4.27E-05	2.86E-05	1.48E-05	
4560	4.23E-05	2.74E-05	1.47E-05	
4590	4.09E-05	2.75E-05	1.46E-05	
4620	4.04E-05	2.68E-05	1.50E-05	
4650	4.13E-05	2.82E-05	1.43E-05	
4680	4.12E-05	2.78E-05	1.47E-05	
4710	4.12E-05	2.65E-05	1.48E-05	
4740	4.12E-05	2.70E-05	1.47E-05	
4770	4.10E-05	2.83E-05	1.45E-05	
4800	4.13E-05	2.74E-05	1.44E-05	
4830	4.12E-05	4.16E-05	1.43E-05	
4860	4.12E-05	8.38E-05	1.42E-05	
4890	4.09E-05	5.22E-04	1.43E-05	
4920	4.10E-05	1.22E-03	1.38E-05	
4950	4.02E-05	1.62E-03	1.37E-05	
4980	4.09E-05	1.57E-03	1.40E-05	
5010	4.03E-05	1.40E-03	1.42E-05	
5040	4.05E-05	1.00E-03	1.40E-05	
5070	4.10E-05	9.86E-04	1.41E-05	
5100	3.97E-05	9.96E-04	1.41E-05	
5130		6.17E-03	1.32E-05	
5160		(6.15E-03)	1.32E-05	
5190		(6.13E-03)	(1.32E-05)	
5220		(6.11E-03)	(1.31E-05)	
5250		(6.09E-03)	(1.31E-05)	
5280		(6.07E-03)	(1.30E-05)	
5310		(6.05E-03)	(1.30E-05)	
5340		(6.03E-03)	(1.30E-05)	
5370		(6.01E-03)	(1.29E-05)	
5400		(5.99E-03)	(1.29E-05)	
FIRST DATA ALT	300	180	150	60
LAST DATA ALT	5100	5130	5160	1680

FLIGHT NO. C-437
EQUIVALENT ATTENUATION LENGTH

(JOB 6513 DATE 03/29/79)
DATE 22778 FLIGHT NO. C-437 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(7.97E 03)	(8.65E 03)	(2.16E 04)	(1.36E 04)
300	8.09E 03	9.90E 03	2.14E 04	2.16E 04
600	9.56E 03	1.26E 04	2.52E 04	2.71E 04
900	1.09E 04	1.47E 04	2.97E 04	3.25E 04
1200	1.20E 04	1.65E 04	3.27E 04	3.67E 04
1500	1.29E 04	1.79E 04	3.52E 04	3.96E 04
1800	1.34E 04	1.92E 04	3.74E 04	(4.19E 04)
2100	1.38E 04	2.02E 04	3.93E 04	
2400	1.42E 04	2.12E 04	4.09E 04	
2700	1.46E 04	2.20E 04	4.24E 04	
3000	1.49E 04	2.27E 04	4.37E 04	
3300	1.52E 04	2.33E 04	4.49E 04	
3600	1.56E 04	2.39E 04	4.60E 04	
3900	1.60E 04	2.44E 04	4.70E 04	
4200	1.63E 04	2.49E 04	4.79E 04	
4500	1.66E 04	2.55E 04	4.88E 04	
4800	1.70E 04	2.60E 04	4.97E 04	
5100	1.73E 04	1.12E 04	5.06E 04	
5400		(2.45E 03)	(5.16E 04)	

FLIGHT NO. C-437
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

$T_{R_1} = 0.0630$

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.64E-01	9.70E-01	9.86E-01	9.86E-01
600	9.39E-01	9.53E-01	9.77E-01	9.78E-01
900	9.21E-01	9.41E-01	9.70E-01	9.73E-01
1200	9.05E-01	9.30E-01	9.64E-01	9.68E-01
1500	8.90E-01	9.20E-01	9.58E-01	9.63E-01
1800	8.74E-01	9.10E-01	9.53E-01	(9.58E-01)
2100	8.59E-01	9.01E-01	9.48E-01	
2400	8.45E-01	8.93E-01	9.43E-01	
2700	8.31E-01	8.84E-01	9.38E-01	
3000	8.17E-01	8.76E-01	9.34E-01	
3300	8.05E-01	8.68E-01	9.29E-01	
3600	7.94E-01	8.60E-01	9.25E-01	
3900	7.83E-01	8.52E-01	9.20E-01	
4200	7.73E-01	8.45E-01	9.16E-01	
4500	7.63E-01	8.38E-01	9.12E-01	
4800	7.54E-01	8.31E-01	9.08E-01	
5100	7.45E-01	6.35E-01	9.04E-01	
5400		(1.11E-01)	(9.01E-01)	

FLIGHT C-438 - 1 MARCH 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2	0902	0926	0.40	65.3	-	62.8	1650	762

Flight Description. Flight C-438 was a morning flight with take off at 0836 and landing at 1038 GMT. There were broken middle and high clouds. The approximate west to east Birkhof track in southwest Germany was over a plateau surrounded by forest and some small villages. Typical terrain features were forest cover with intermittent snow covered high ground and bare ground in the low valleys.

In-Flight Notes. The in-flight observer reported 1/8 to 2/8 altostratus at 2700 meters (9000 feet) at the west end of the track and 7/8 cirrus at 6000 meters (20,000 feet) over the entire track. The thin altostratus deck was moving slowly east and starting to dissipate. Slant range visibility was 24 kilometers (15 miles). The flight was aborted at 0940 GMT due to a short in the data logger system.

Local Weather Notes. Freudenstad, 53 kilometers west of the track center, observed 5/8 altocumulus at 2100 meters (7000 feet) and 6/8 cirrus at 6000 meters (20,000 feet) with visibilities of 65 kilometers.

Spaichinger, 28 kilometers southwest of the track center, reported 2/8 to 3/8 altocumulus at 2400 meters (8000 feet) and 5/8 to 7/8 cirrus at 6900 meters (23,000 feet) with visibility 75 kilometers.

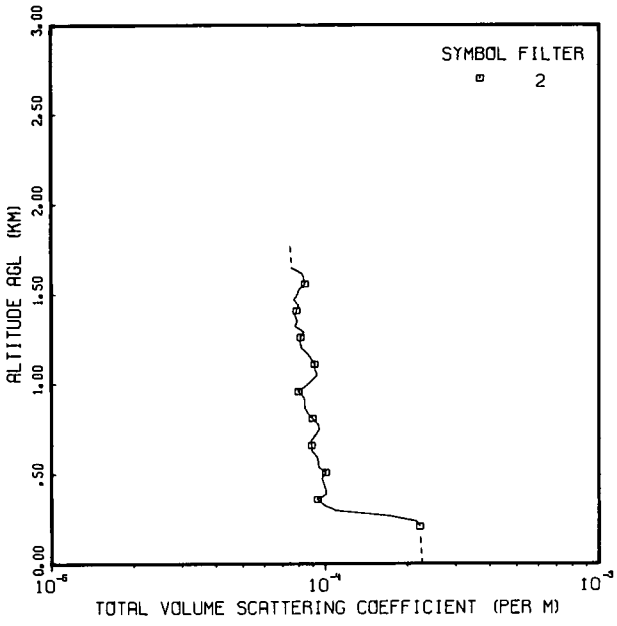
Ulm, 68 kilometers eastnortheast of the track center, reported skies obscured with ceilings zero to 30 meters (100 feet) and visibility zero to 0.3 kilometers in fog.

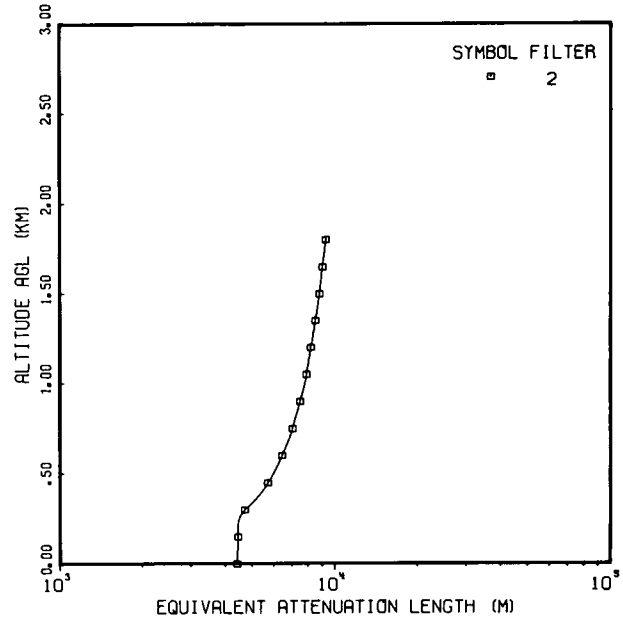
The radiosonde station at Neuchatel was 225 kilometers southwest and upstream from the track. There was no appropriate vertical cross section.

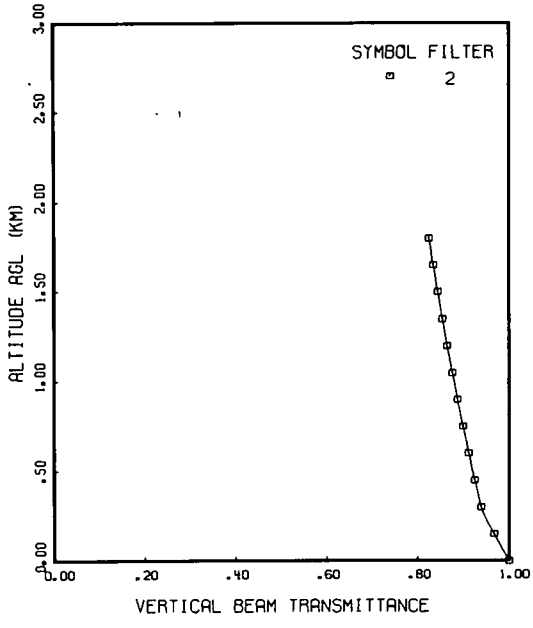
Synoptic Remarks. The surface chart showed that an occluded front extended from the Irish Sea to Belgium then as a cold front southward through eastern France into Algeria and then westward into the Atlantic to an advancing complex system. There was widespread fog in advance of the frontal system in Europe. At 500 millibars there was slight ridging from Sicily to Belgium and southsouthwesterly flow. The air mass was modified stable maritime polar.

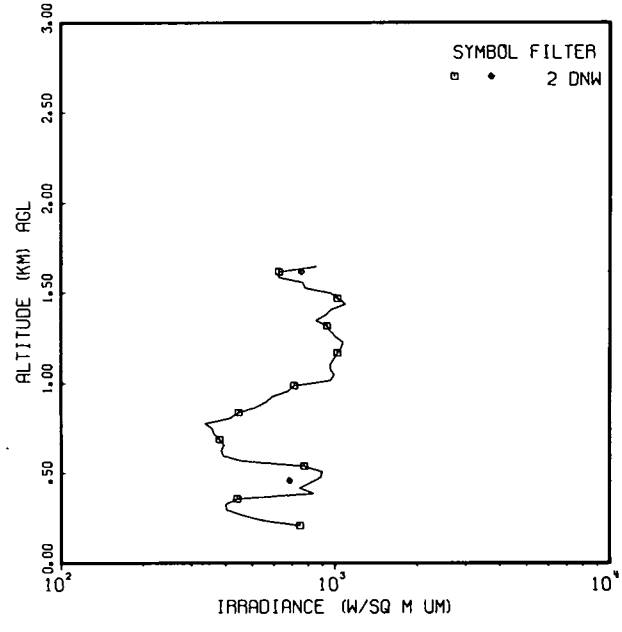
FLIGHT NO. C-438

BIRKHOF









FLIGHT NO. C-438
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6520 DATE 03/29/79)
DATE 30178 FLIGHT NO. C-438 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2
0	(2.26E-04)
30	(2.25E-04)
60	(2.25E-04)
90	(2.24E-04)
120	(2.23E-04)
150	(2.23E-04)
180	(2.22E-04)
210	2.22E-04
240	2.16E-04
270	1.71E-04
300	1.09E-04
330	9.87E-05
360	9.36E-05
390	1.01E-04
420	1.00E-04
450	9.88E-05
480	9.74E-05
510	1.01E-04
540	9.48E-05
570	9.43E-05
600	9.33E-05
630	8.97E-05
660	8.93E-05
690	8.93E-05
720	9.24E-05
750	9.51E-05
780	9.41E-05
810	9.01E-05
840	8.65E-05
870	8.43E-05
900	8.43E-05
930	8.35E-05
960	7.99E-05
990	8.49E-05
1020	8.91E-05
1050	9.35E-05
1080	9.19E-05
1110	9.16E-05
1140	8.89E-05
1170	8.63E-05
1200	8.21E-05
1230	8.12E-05
1260	8.12E-05
1290	8.36E-05
1320	7.78E-05
1350	7.91E-05
1380	7.75E-05
1410	7.86E-05
1440	8.02E-05
1470	7.67E-05
1500	7.89E-05

FLIGHT NO. C-438
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6520 DATE 03/29/79)
DATE 30178 FLIGHT NO. C-438 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2
1530	8.02E-05
1560	8.43E-05
1590	8.36E-05
1620	8.23E-05
1650	7.54E-05
1680	(7.52E-05)
1710	(7.49E-05)
1740	(7.47E-05)
1770	(7.45E-05)
1800	(7.42E-05)

FIRST DATA ALT 210

LAST DATA ALT 1650

FLIGHT NO. C-438
EQUIVALENT ATTENUATION LENGTH

(JOB 6520 DATE 03/29/79)
DATE 30178 FLIGHT NO. C-438 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2
0	(4.42E 03)
300	4.72E 03
600	6.46E 03
900	7.50E 03
1200	8.21E 03
1500	8.82E 03
1800	(9.30E 03)

FLIGHT NO. C-438
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2
0	1.00E 00
300	9.38E-01
600	9.11E-01
900	8.87E-01
1200	8.64E-01
1500	8.44E-01
1800	(8.24E-01)

FLIGHT C-439 - 1 MARCH 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	1257	1342	0.75	58.6	-	62.3	1650	762
4,5	1352	1433	0.68	63.3	-	68.0	1620	762

Flight Description. Flight C-439 was an afternoon flight with take off at 1213 and landing at 1510 GMT. There were scattered to broken middle clouds and broken to overcast high clouds. The approximate west to east Birkhof track in southwest Germany was over a plateau surrounded by forest and some small villages. Typical terrain features were forest cover with intermittent snow covered fields and valleys that presented a black and white patchwork.

In-Flight Notes. The in-flight observer reported scattered altostratus at 3000 meters (10,000 feet) and broken to overcast cirrostratus at 6000 meters (20,000 feet). By 1310 GMT the altostratus had increased to broken and became denser and sometimes overcast. The altostratus moved in from the south and data were taken below the deck. Slant range visibilities were 24 to 40 kilometers (15 to 25 miles) at 1200 and 2400 meters (4000 and 8000 feet) becoming 24 kilometers (15 miles) by 1335 GMT at all altitudes.

Local Weather Notes. Freudenstad, 53 kilometers west of the track, observed 7/8 to 4/8 altocumulus at 1800 meters (6000 feet) with 1/8 to 3/8 stratocumulus at 1500 meters (5000 feet) after 1500 GMT and 6/8 thin cirrus at 6000 meters (20,000 feet) after 1500 GMT. Visibilities were 50 to 65 kilometers.

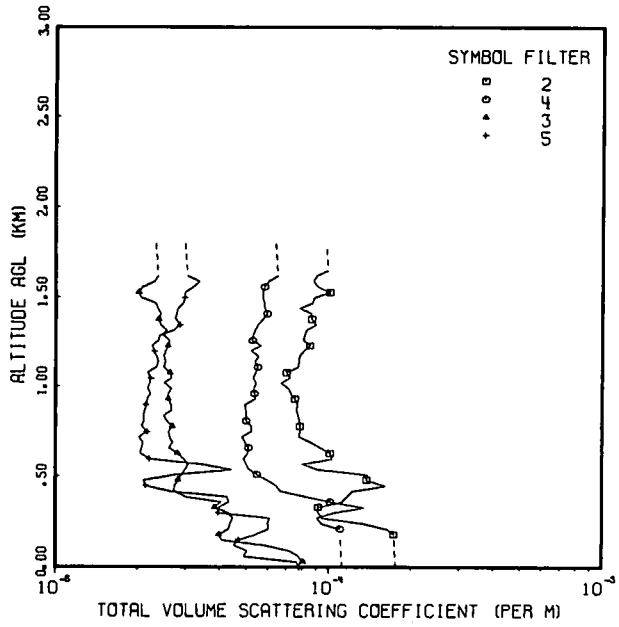
Spaichinger, 28 kilometers southwest of the flight track, had three levels of clouds. There were 1/8 to 3/8 stratocumulus at 1500 meters (5000 feet), 6/8 to 7/8 altocumulus at 3600 meters (12,000 feet) lowering to 2700 meters (9000 feet) and 7/8 cirrostratus at 6900 meters (23,000 feet). Visibility was 60 to 75 kilometers.

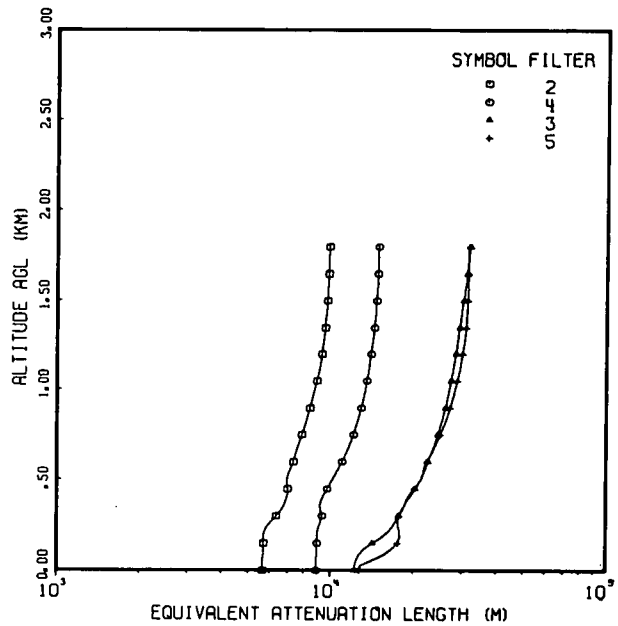
Ulm, 68 kilometers eastnortheast of the track center, had an obscured sky with a ceiling of 90 meters (300 feet) and visibility of 0.8 kilometers in fog at 1300 GMT. Conditions gradually improved with 1/8 to 2/8 stratus at 90 to 150 meters (300 to 500 feet), 4/8 altocumulus at 3000 meters (10,000 feet) and 7/8 cirrus at 7200 meters (24,000 feet). Visibility improved to 1.8 kilometers in light fog.

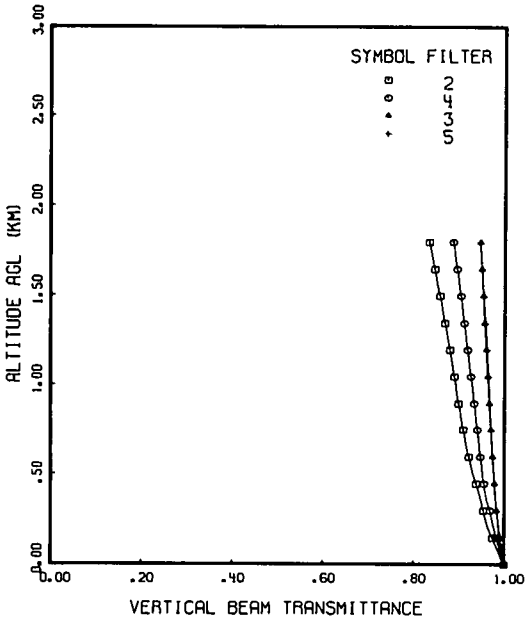
The radiosonde station at Neuchatel was 225 kilometers southwest and upstream from the track. There was no appropriate vertical cross section.

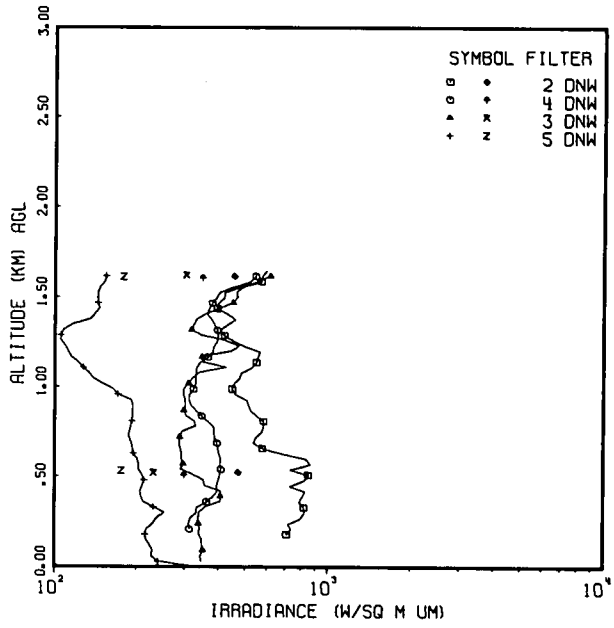
Synoptic Remarks. The surface chart showed that an occluded front extended from the Irish Sea to Belgium then as a cold front southward through eastern France into Algeria and then westward into the Atlantic to an advancing complex system. There was widespread fog in advance of the frontal system in Europe. At 500 millibars there was slight ridging from Sicily to Belgium and southsouthwesterly flow. The air mass was modified stable maritime polar.

FLIGHT NO. C-439
BIRKHOF









FLIGHT NO. C-439
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6533 DATE 03/29/79)
DATE 30178 FLIGHT NO. C-439 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(1.76E-04)	(1.12E-04)	(8.13E-05)	7.84E-05
30	(1.75E-04)	(1.12E-04)	8.09E-05	7.64E-05
60	(1.75E-04)	(1.12E-04)	7.76E-05	4.92E-05
90	(1.74E-04)	(1.11E-04)	7.21E-05	5.04E-05
120	(1.74E-04)	(1.11E-04)	5.92E-05	4.51E-05
150	(1.74E-04)	(1.11E-04)	4.07E-05	4.67E-05
180	1.73E-04	(1.11E-04)	3.97E-05	5.39E-05
210	1.64E-04	1.10E-04	4.31E-05	6.01E-05
240	1.35E-04	9.41E-05	4.37E-05	5.98E-05
270	9.49E-05	9.07E-05	4.46E-05	6.10E-05
300	9.15E-05	1.04E-04	4.30E-05	3.95E-05
330	9.16E-05	1.35E-04	3.83E-05	3.97E-05
360	1.12E-04	1.01E-04	4.05E-05	4.30E-05
390	1.17E-04	8.20E-05	2.99E-05	4.24E-05
420	1.22E-04	6.65E-05	2.72E-05	2.62E-05
450	1.61E-04	6.42E-05	2.74E-05	2.14E-05
480	1.38E-04	5.94E-05	2.81E-05	2.10E-05
510	1.39E-04	5.47E-05	2.90E-05	2.73E-05
540	9.07E-05	5.10E-05	2.99E-05	4.41E-05
570	8.01E-05	5.00E-05	3.07E-05	3.43E-05
600	1.03E-04	4.89E-05	2.94E-05	2.21E-05
630	1.01E-04	5.06E-05	2.80E-05	2.05E-05
660	9.34E-05	5.09E-05	2.61E-05	2.07E-05
690	8.59E-05	4.96E-05	2.69E-05	2.10E-05
720	7.80E-05	4.83E-05	2.61E-05	2.02E-05
750	7.87E-05	5.20E-05	2.59E-05	2.17E-05
780	7.84E-05	5.23E-05	2.68E-05	2.07E-05
810	7.82E-05	5.00E-05	2.56E-05	2.11E-05
840	7.72E-05	5.01E-05	2.49E-05	2.10E-05
870	7.63E-05	4.99E-05	2.65E-05	2.13E-05
900	7.69E-05	4.93E-05	2.64E-05	2.15E-05
930	7.52E-05	5.37E-05	2.59E-05	2.17E-05
960	7.26E-05	5.34E-05	2.58E-05	2.23E-05
990	7.11E-05	5.33E-05	2.66E-05	2.18E-05
1020	6.66E-05	5.43E-05	2.50E-05	2.22E-05
1050	7.22E-05	5.30E-05	2.66E-05	2.23E-05
1080	7.00E-05	5.40E-05	2.62E-05	2.17E-05
1110	7.71E-05	5.50E-05	2.49E-05	2.33E-05
1140	7.76E-05	5.35E-05	2.53E-05	2.37E-05
1170	7.79E-05	5.54E-05	2.49E-05	2.35E-05
1200	8.10E-05	5.16E-05	2.53E-05	2.30E-05
1230	8.50E-05	5.64E-05	2.58E-05	2.25E-05
1260	8.09E-05	5.25E-05	2.62E-05	2.38E-05
1290	8.15E-05	5.29E-05	2.48E-05	2.40E-05
1320	8.28E-05	5.38E-05	2.56E-05	2.71E-05
1350	8.97E-05	5.50E-05	2.42E-05	2.85E-05
1380	8.65E-05	5.72E-05	2.39E-05	2.75E-05
1410	8.63E-05	5.94E-05	2.43E-05	2.78E-05
1440	7.79E-05	5.82E-05	2.36E-05	2.81E-05
1470	8.68E-05	5.81E-05	2.33E-05	2.94E-05
1500	8.81E-05	5.71E-05	2.06E-05	2.96E-05

FLIGHT NO. C-439
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6533 DATE 03/29/79)
DATE 30178 FLIGHT NO. C-439 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	1.01E-04	5.72E-05	2.01E-05	2.98E-05
1560	9.09E-05	5.81E-05	2.08E-05	3.19E-05
1590	8.77E-05	6.01E-05	2.30E-05	3.37E-05
1620	8.98E-05	6.49E-05	2.37E-05	3.04E-05
1650	9.87E-05	(6.47E-05)	(2.37E-05)	(3.03E-05)
1680	(9.84E-05)	(6.45E-05)	(2.36E-05)	(3.02E-05)
1710	(9.81E-05)	(6.43E-05)	(2.35E-05)	(3.01E-05)
1740	(9.78E-05)	(6.41E-05)	(2.34E-05)	(3.00E-05)
1770	(9.75E-05)	(6.39E-05)	(2.34E-05)	(2.99E-05)
1800	(9.72E-05)	(6.37E-05)	(2.33E-05)	(2.98E-05)
FIRST DATA ALT	180	210	30	0
LAST DATA ALT	1650	1620	1620	1620

FLIGHT NO. C-439
EQUIVALENT ATTENUATION LENGTH

(JOB 6533 DATE 03/29/79)
DATE 30178 FLIGHT NO. C-439 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(5.67E 03)	(8.89E 03)	(1.23E 04)	1.28E 04
300	6.36E 03	9.34E 03	1.77E 04	1.78E 04
600	7.34E 03	1.10E 04	2.27E 04	2.24E 04
900	8.43E 03	1.30E 04	2.62E 04	2.72E 04
1200	9.30E 03	1.40E 04	2.85E 04	3.02E 04
1500	9.73E 03	1.47E 04	3.04E 04	3.14E 04
1800	(9.85E 03)	(1.49E 04)	(3.20E 04)	(3.16E 04)

FLIGHT NO. C-439
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

$\tau_{Ri} = 0.0173$

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.54E-01	9.68E-01	9.83E-01	9.83E-01
600	9.22E-01	9.47E-01	9.74E-01	9.74E-01
900	8.99E-01	9.33E-01	9.66E-01	9.67E-01
1200	8.79E-01	9.18E-01	9.59E-01	9.61E-01
1500	8.57E-01	9.03E-01	9.52E-01	9.53E-01
1800	(8.33E-01)	(8.86E-01)	(9.45E-01)	(9.45E-01)

FLIGHT C-440 - 2 MARCH 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
4,5	1100	1252	1.87	56.1	55.5	58.0	5340	762
2,3	1259	1453	1.90	58.4	-	70.3	4350	762

Flight Description. Flight C-440 was a midday flight spanning local apparent noon with take off at 1025 and landing at 1525 GMT. There were multiple cloud layers and the highest level was broken to overcast cirrus. The approximate west to east Birkhof track in southwest Germany was over a plateau surrounded by forest and some small villages. Typical terrain features were forest cover with intermittent snow covered fields and valleys that presented a black and white patchwork. The snow covered areas were smaller than on previous flights.

In-Flight Notes. The in-flight observer noted 7/8 thin cirrus at 7600 meters (25,000 feet) at 1105 GMT. There was 1/8 altostratus at 3700 meters (12,000 feet) at 1125 GMT. Cirrus was multi-layered after 1155 GMT with scattered layer at 6000 meters (20,000 feet) and thin overcast at 7600 meters (25,000 feet). Cirrus bases lowered to 5200 to 5500 meters (17,000 to 18,000 feet) after 1300 GMT. Some scattered stratocumulus formed to the north over low areas about 1130 GMT but an apparent foehn effect that was dominant over the track kept the lower clouds to the north. Slant visibilities were generally about 16 kilometers (10 miles) except for 24 kilometers (15 miles) at 6000 meters (20,000 feet) and 13 kilometers (8 miles) at 3700 meters (12,000 feet) with moderate haze.

Local Weather Notes. Freudenstad, 53 kilometers west of the track center, reported 1/8 to 2/8 stratocumulus at 450 to 600 meters (1500 to 2000 feet), 3/8 altocumulus at 3000 meters (10,000 feet), and 5/8 to 7/8 cirrus and cirrostratus at 6900 meters (23,000 feet). Visibility was 35 to 60 kilometers.

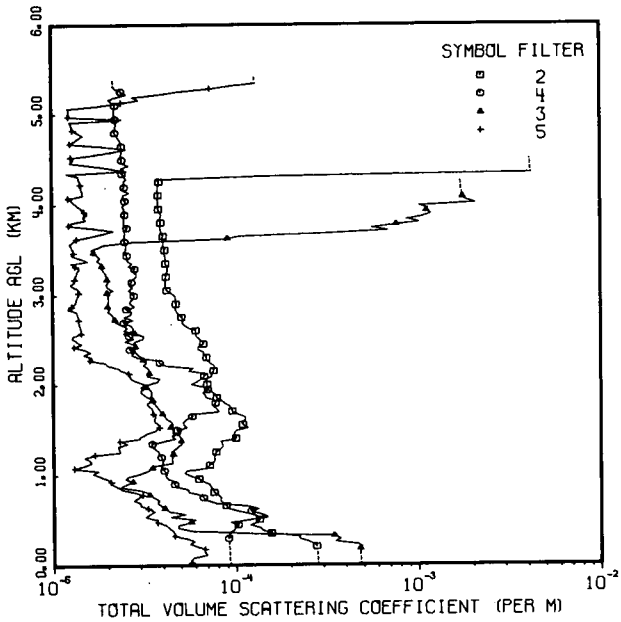
Spaichinger, 28 kilometers southwest of the track center, observed 1/8 altocumulus at 3000 meters (10,000 feet) and 7/8 decreasing to 5/8 cirrus at 6900 meters (23,000 feet) until 1200 GMT. At 1300 GMT there was 5/8 altostratus at 3000 meters that decreased to 2/8 by 1500 GMT and 7/8 cirrostratus at 6600 meters (22,000 feet) that increased to 8/8 and lowered to 6000 meters (20,000 feet) by 1400 GMT. Visibilities were recorded as 50 to 60 kilometers.

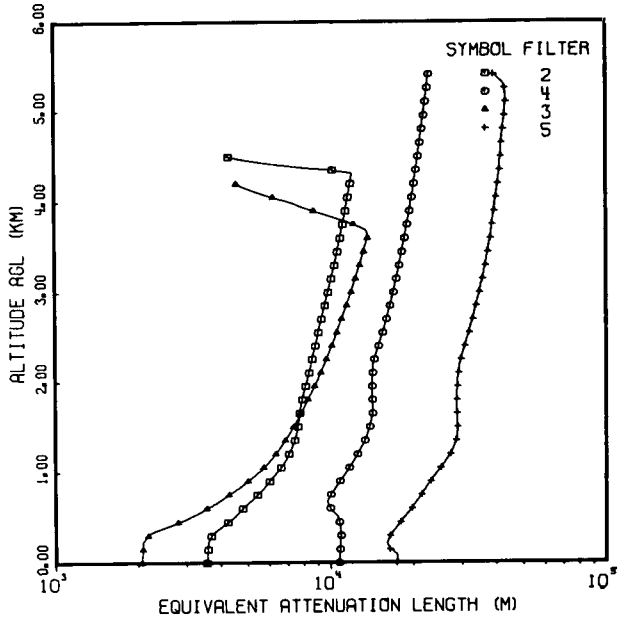
Ulm, 68 kilometers eastnortheast of the track center, had an obscured sky with ceiling 60 meters (200 feet) and visibility 0.3 kilometers in fog at 1000 GMT. By 1100 GMT conditions had improved to 5/8 stratocumulus at 1200 meters (4000 feet) and 6/8 cirrus at 7500 meters (25,000 feet) with visibilty 3.2 kilometers in light fog. The stratocumulus decreased to 1/8 to 2/8 at 1200 meters (4000 feet) with 4/8 to 5/8 cirrus at 7500 meters (25,000 feet) from 1200 GMT. Scattered altocumulus at 2700 meters (9000 feet) increased from 4/8 at 1400 to overcast by 1500 GMT. Visibility gradually improved to 12 kilometers by 1400 GMT.

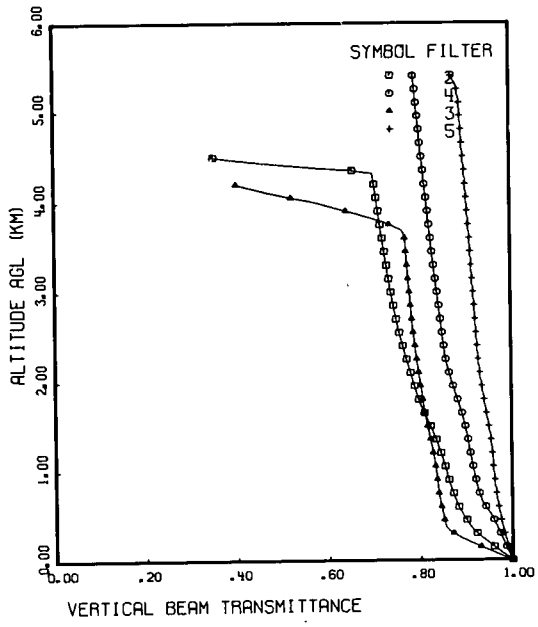
The radiosonde station at Neuchatel was 225 kilometers southwest and in an airflow parallel to the track. There was no appropriate vertical cross section.

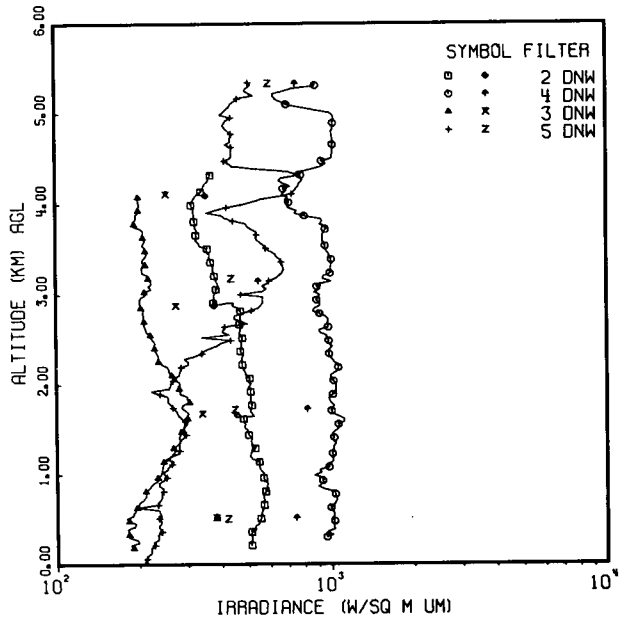
Synoptic Remarks. The surface chart indicated that an occluded front extended from a low in the English Channel through western France and central Spain and then southsouthwestward into the Atlantic. The southerly surface flow was advecting moisture from the Mediterranean into the track area. At 500 millibars there were lows centered south of Sicily and southeast of Iceland with troughing through Great Britain southeastward to Italy. The flow was southerly at this level also. The air mass was stable maritime polar.

FLIGHT NO. C-440
BIRKHOF









FLIGHT NO. C-440
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6537 DATE 03/29/79)
DATE 30278 FLIGHT NO. C-440 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(2.81E-04)	(9.30E-05)	(4.85E-04)	(5.72E-05)
30	(2.79E-04)	(9.25E-05)	(4.83E-04)	5.69E-05
60	(2.78E-04)	(9.23E-05)	(4.81E-04)	5.69E-05
90	(2.78E-04)	(9.21E-05)	(4.80E-04)	5.82E-05
120	(2.77E-04)	(9.18E-05)	(4.79E-04)	6.91E-05
150	(2.76E-04)	(9.16E-05)	(4.78E-04)	6.71E-05
180	(2.76E-04)	(9.14E-05)	4.77E-04	6.74E-05
210	2.75E-04	(9.11E-05)	4.88E-04	6.14E-05
240	2.67E-04	(9.09E-05)	4.54E-04	5.58E-05
270	2.48E-04	(9.07E-05)	3.50E-04	5.90E-05
300	2.21E-04	9.04E-05	3.72E-04	5.36E-05
330	2.23E-04	9.45E-05	3.43E-04	4.60E-05
360	1.56E-04	9.04E-05	1.14E-04	4.57E-05
390	1.40E-04	9.62E-05	5.61E-05	4.46E-05
420	1.36E-04	9.92E-05	4.82E-05	4.26E-05
450	1.19E-04	1.02E-04	4.85E-05	4.10E-05
480	1.30E-04	9.32E-05	5.65E-05	3.73E-05
510	1.34E-04	1.16E-04	5.97E-05	3.66E-05
540	1.34E-04	1.49E-04	4.40E-05	3.19E-05
570	1.20E-04	1.38E-04	5.24E-05	3.36E-05
600	1.03E-04	1.20E-04	4.31E-05	3.57E-05
630	9.06E-05	1.33E-04	4.07E-05	3.31E-05
660	8.81E-05	1.14E-04	3.89E-05	3.03E-05
690	8.45E-05	7.69E-05	3.71E-05	3.00E-05
720	8.18E-05	6.84E-05	3.80E-05	2.75E-05
750	8.31E-05	6.60E-05	3.56E-05	2.92E-05
780	7.99E-05	6.41E-05	3.35E-05	3.06E-05
810	7.57E-05	5.50E-05	3.27E-05	2.80E-05
840	7.59E-05	5.51E-05	2.91E-05	2.37E-05
870	7.24E-05	4.73E-05	2.33E-05	2.25E-05
900	7.21E-05	4.60E-05	2.47E-05	2.10E-05
930	6.63E-05	4.66E-05	2.72E-05	2.07E-05
960	6.25E-05	4.24E-05	2.48E-05	1.96E-05
990	5.74E-05	4.11E-05	2.61E-05	1.81E-05
1020	5.23E-05	4.19E-05	2.99E-05	1.65E-05
1050	5.35E-05	4.04E-05	3.28E-05	1.76E-05
1080	6.83E-05	3.38E-05	3.49E-05	1.31E-05
1110	7.18E-05	3.96E-05	3.69E-05	1.47E-05
1140	7.53E-05	3.97E-05	4.52E-05	1.62E-05
1170	7.66E-05	4.03E-05	4.45E-05	1.58E-05
1200	7.63E-05	3.90E-05	4.50E-05	1.48E-05
1230	7.69E-05	3.82E-05	4.54E-05	1.69E-05
1260	7.81E-05	3.79E-05	4.43E-05	2.32E-05
1290	8.20E-05	3.63E-05	4.67E-05	2.29E-05
1320	8.53E-05	3.48E-05	4.86E-05	2.26E-05
1350	8.42E-05	3.49E-05	5.05E-05	2.55E-05
1380	8.30E-05	4.01E-05	5.03E-05	2.33E-05
1410	1.00E-04	4.57E-05	5.05E-05	2.97E-05
1440	9.65E-05	4.44E-05	4.93E-05	3.10E-05
1470	9.87E-05	4.99E-05	4.56E-05	3.32E-05
1500	1.01E-04	4.79E-05	4.58E-05	3.68E-05

FLIGHT NO. C-440
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6537 DATE 03/29/79)
DATE 30278 FLIGHT NO. C-440 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	1.17E-04	5.40E-05	4.42E-05	3.84E-05
1560	1.09E-04	5.18E-05	4.54E-05	3.77E-05
1590	1.11E-04	5.17E-05	4.44E-05	3.63E-05
1620	1.13E-04	5.38E-05	4.19E-05	3.62E-05
1650	1.13E-04	5.78E-05	4.12E-05	3.67E-05
1680	1.02E-04	5.72E-05	3.98E-05	3.55E-05
1710	9.59E-05	8.14E-05	3.89E-05	3.56E-05
1740	9.46E-05	7.85E-05	3.81E-05	3.50E-05
1770	9.32E-05	7.57E-05	3.68E-05	3.36E-05
1800	8.73E-05	7.78E-05	3.64E-05	3.30E-05
1830	8.40E-05	7.88E-05	3.52E-05	3.54E-05
1860	7.89E-05	6.96E-05	3.41E-05	3.35E-05
1890	7.96E-05	6.84E-05	3.50E-05	3.17E-05
1920	7.47E-05	6.64E-05	3.47E-05	3.04E-05
1950	7.11E-05	7.09E-05	3.42E-05	3.08E-05
1980	7.02E-05	6.71E-05	3.25E-05	3.14E-05
2010	7.02E-05	5.74E-05	3.35E-05	3.20E-05
2040	6.95E-05	6.13E-05	3.75E-05	2.88E-05
2070	7.00E-05	6.50E-05	3.87E-05	2.69E-05
2100	7.39E-05	6.76E-05	3.31E-05	2.66E-05
2130	7.41E-05	7.01E-05	3.39E-05	2.62E-05
2160	7.60E-05	5.57E-05	3.41E-05	2.40E-05
2190	7.77E-05	5.87E-05	3.32E-05	2.28E-05
2220	7.64E-05	4.16E-05	3.14E-05	2.00E-05
2250	7.25E-05	3.86E-05	3.26E-05	1.95E-05
2280	6.98E-05	3.90E-05	3.14E-05	1.61E-05
2310	6.97E-05	2.93E-05	3.10E-05	1.65E-05
2340	6.82E-05	2.71E-05	2.93E-05	1.48E-05
2370	6.70E-05	2.81E-05	2.86E-05	1.61E-05
2400	6.25E-05	2.65E-05	2.83E-05	1.49E-05
2430	6.29E-05	2.80E-05	2.85E-05	1.32E-05
2460	6.70E-05	2.79E-05	2.80E-05	1.44E-05
2490	6.68E-05	2.50E-05	2.85E-05	1.35E-05
2520	6.32E-05	2.79E-05	3.12E-05	1.29E-05
2550	6.15E-05	2.63E-05	3.18E-05	1.31E-05
2580	6.10E-05	2.45E-05	2.83E-05	1.44E-05
2610	6.10E-05	2.77E-05	2.47E-05	1.43E-05
2640	5.52E-05	2.77E-05	2.58E-05	1.42E-05
2670	5.27E-05	2.68E-05	2.40E-05	1.41E-05
2700	5.12E-05	2.47E-05	2.25E-05	1.40E-05
2730	5.26E-05	2.76E-05	2.20E-05	1.39E-05
2760	5.10E-05	2.47E-05	2.17E-05	1.38E-05
2790	4.90E-05	2.68E-05	2.12E-05	1.38E-05
2820	4.82E-05	2.73E-05	2.03E-05	1.37E-05
2850	4.71E-05	2.55E-05	2.06E-05	1.22E-05
2880	4.79E-05	2.83E-05	2.01E-05	1.28E-05
2910	4.76E-05	2.69E-05	2.03E-05	1.33E-05
2940	4.78E-05	2.69E-05	2.04E-05	1.35E-05
2970	4.74E-05	2.77E-05	2.03E-05	1.36E-05
3000	4.70E-05	2.81E-05	2.03E-05	1.38E-05

FLIGHT NO. C-440
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6537 DATE 03/29/79)
DATE 30278 FLIGHT NO. C-440 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	4.44E-05	2.73E-05	2.00E-05	1.40E-05
3060	4.25E-05	2.63E-05	2.16E-05	1.41E-05
3090	4.19E-05	2.77E-05	2.01E-05	1.34E-05
3120	4.16E-05	2.64E-05	1.98E-05	1.26E-05
3150	4.16E-05	2.73E-05	2.04E-05	1.32E-05
3180	4.15E-05	2.76E-05	2.00E-05	1.33E-05
3210	4.21E-05	2.89E-05	1.99E-05	1.35E-05
3240	4.18E-05	2.90E-05	1.98E-05	1.37E-05
3270	4.29E-05	2.78E-05	1.92E-05	1.38E-05
3300	4.26E-05	2.83E-05	1.83E-05	1.41E-05
3330	4.26E-05	2.62E-05	1.87E-05	1.35E-05
3360	4.19E-05	2.77E-05	1.87E-05	1.28E-05
3390	4.21E-05	2.58E-05	1.77E-05	1.57E-05
3420	4.19E-05	2.59E-05	1.84E-05	1.42E-05
3450	4.16E-05	2.58E-05	1.76E-05	1.28E-05
3480	4.11E-05	2.46E-05	1.69E-05	1.32E-05
3510	4.15E-05	2.54E-05	1.65E-05	1.30E-05
3540	4.10E-05	2.56E-05	1.81E-05	1.28E-05
3570	4.09E-05	2.54E-05	1.96E-05	1.26E-05
3600	4.08E-05	2.50E-05	2.74E-05	1.31E-05
3630	4.03E-05	2.49E-05	9.13E-05	1.37E-05
3660	4.07E-05	2.51E-05	1.07E-04	1.64E-05
3690	4.02E-05	2.53E-05	3.23E-04	1.91E-05
3720	3.96E-05	2.49E-05	6.87E-04	2.18E-05
3750	3.93E-05	2.58E-05	5.63E-04	1.71E-05
3780	3.93E-05	2.50E-05	7.63E-04	1.25E-05
3810	3.95E-05	2.49E-05	1.02E-03	1.29E-05
3840	3.93E-05	2.49E-05	8.70E-04	1.54E-05
3870	3.95E-05	2.47E-05	1.06E-03	1.48E-05
3900	3.97E-05	2.51E-05	1.19E-03	1.57E-05
3930	3.88E-05	2.49E-05	1.12E-03	1.51E-05
3960	3.83E-05	2.50E-05	1.14E-03	1.46E-05
3990	3.79E-05	2.43E-05	1.02E-03	1.41E-05
4020	3.85E-05	2.55E-05	2.07E-03	1.35E-05
4050	3.79E-05	2.52E-05	1.83E-03	1.30E-05
4080	3.83E-05	2.45E-05	1.76E-03	1.24E-05
4110	3.83E-05	2.47E-05	(1.76E-03)	1.48E-05
4140	3.82E-05	2.65E-05	(1.75E-03)	1.47E-05
4170	3.82E-05	2.42E-05	(1.74E-03)	1.46E-05
4200	3.82E-05	2.49E-05	(1.74E-03)	1.45E-05
4230	3.86E-05	2.51E-05		1.44E-05
4260	3.87E-05	2.48E-05		1.43E-05
4290	3.74E-05	2.57E-05		1.42E-05
4320	1.43E-04	2.49E-05		1.41E-05
4350	4.19E-05	2.43E-05		1.22E-05
4380	(4.18E-05)	2.44E-05		2.47E-05
4410	(4.16E-05)	2.42E-05		2.07E-05
4440	(4.15E-05)	2.64E-05		1.67E-05
4470	(4.14E-05)	2.42E-05		1.26E-05
4500	(4.12E-05)	2.42E-05		1.32E-05

FLIGHT NO. C-440
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6537 DATE 03/29/79)
DATE 30278 FLIGHT NO. C-440 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	FILTERS	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) 2	4	3	5
4530			2.40E-05		1.27E-05
4560			2.42E-05		1.70E-05
4590			2.44E-05		2.13E-05
4620			2.41E-05		2.56E-05
4650			2.42E-05		1.91E-05
4680			2.40E-05		1.27E-05
4710			2.38E-05		1.34E-05
4740			2.33E-05		1.41E-05
4770			2.28E-05		1.48E-05
4800			2.23E-05		1.40E-05
4830			2.24E-05		1.31E-05
4860			2.25E-05		1.30E-05
4890			2.26E-05		1.28E-05
4920			2.25E-05		1.27E-05
4950			2.23E-05		2.43E-05
4980			2.23E-05		1.24E-05
5010			2.21E-05		1.24E-05
5040			2.22E-05		1.24E-05
5070			2.23E-05		1.24E-05
5100			2.23E-05		1.82E-05
5130			2.15E-05		2.41E-05
5160			2.06E-05		3.00E-05
5190			2.25E-05		2.79E-05
5220			2.58E-05		3.87E-05
5250			2.41E-05		4.96E-05
5280			2.25E-05		7.34E-05
5310			2.19E-05		9.43E-05
5340			(2.18E-05)		1.31E-04
5370			(2.18E-05)		(1.30E-04)
5400			(2.17E-05)		(1.30E-04)
FIRST DATA ALT		210	300	180	30
LAST DATA ALT		4350	5310	4080	5340

FLIGHT NO. C-440
EQUIVALENT ATTENUATION LENGTH

(JOB 6537 DATE 03/29/79)
DATE 30278 FLIGHT NO. C-440 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(3.54E 03)	(1.08E 04)	(2.06E 03)	(1.75E 04)
300	3.70E 03	1.09E 04	2.17E 03	1.65E 04
600	4.81E 03	1.00E 04	3.55E 03	1.98E 04
900	6.03E 03	1.09E 04	5.02E 03	2.32E 04
1200	7.10E 03	1.26E 04	6.34E 03	2.73E 04
1500	7.68E 03	1.40E 04	7.37E 03	2.91E 04
1800	7.94E 03	1.43E 04	8.34E 03	2.89E 04
2100	8.43E 03	1.43E 04	9.27E 03	2.93E 04
2400	8.87E 03	1.50E 04	1.02E 04	3.09E 04
2700	9.35E 03	1.61E 04	1.11E 04	3.30E 04
3000	9.88E 03	1.71E 04	1.20E 04	3.50E 04
3300	1.04E 04	1.79E 04	1.29E 04	3.67E 04
3600	1.10E 04	1.88E 04	1.37E 04	3.83E 04
3900	1.14E 04	1.96E 04	8.77E 03	3.95E 04
4200	1.19E 04	2.03E 04	(4.59E 03)	4.08E 04
4500	(4.30E 03)	2.10E 04		4.16E 04
4800		2.17E 04		4.27E 04
5100		2.24E 04		4.37E 04
5400		(2.30E 04)		(3.94E 04)

FLIGHT NO. C-440
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.22E-01	9.73E-01	8.71E-01	9.82E-01
600	8.83E-01	9.42E-01	8.45E-01	9.70E-01
900	8.61E-01	9.20E-01	8.36E-01	9.62E-01
1200	8.44E-01	9.09E-01	8.28E-01	9.57E-01
1500	8.23E-01	8.98E-01	8.16E-01	9.50E-01
1800	7.97E-01	8.81E-01	8.06E-01	9.40E-01
2100	7.80E-01	8.64E-01	7.97E-01	9.31E-01
2400	7.63E-01	8.52E-01	7.90E-01	9.25E-01
2700	7.49E-01	8.46E-01	7.83E-01	9.22E-01
3000	7.38E-01	8.39E-01	7.78E-01	9.18E-01
3300	7.29E-01	8.32E-01	7.74E-01	9.14E-01
3600	7.20E-01	8.26E-01	7.70E-01	9.10E-01
3900	7.11E-01	8.19E-01	6.41E-01	9.06E-01
4200	7.03E-01	8.13E-01	(4.01E-01)	9.02E-01
4500	(3.51E-01)	8.07E-01		8.98E-01
4800		8.01E-01		8.94E-01
5100		7.96E-01		8.90E-01
5400		(7.91E-01)		(8.72E-01)

FLIGHT C-441 - 3 MARCH 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	1506	1552	0.77	71.7	-	78.4	5280	762
4,5	1556	1641	0.75	79.0	-	86.1	5280	762

Flight Description. Flight C-441 was an afternoon flight with take off at 1450 and landing at 1705 GMT. There were scattered cirrus clouds. The approximate west to east Birkhof track in southwest Germany was over a plateau surrounded by forest and some small villages. Typical terrain features were forest cover with snow over the highest areas of the plateau otherwise dark fields and trees.

In-Flight Notes. The in-flight observer noted thin scattered cirrus clouds at 6000 meters (20,000 feet). The top of the surface haze layer was about 2400-2600 meters (8000-8500 feet). Altostratus began forming in the top of the haze layer about 1540 GMT. Slant range visibility was 13 kilometers (8 miles).

Local Weather Notes. Freudenstad, 53 kilometers west of the track center, reported 1/8 cumulus at 750 meters (2500 feet), 1/8 altocumulus at 3000 meters (10,000 feet) and 2/8 to 5/8 cirrus at 6000 to 6900 meters (20,000 to 23,000 feet). Visibility was recorded as 70 to 75 kilometers.

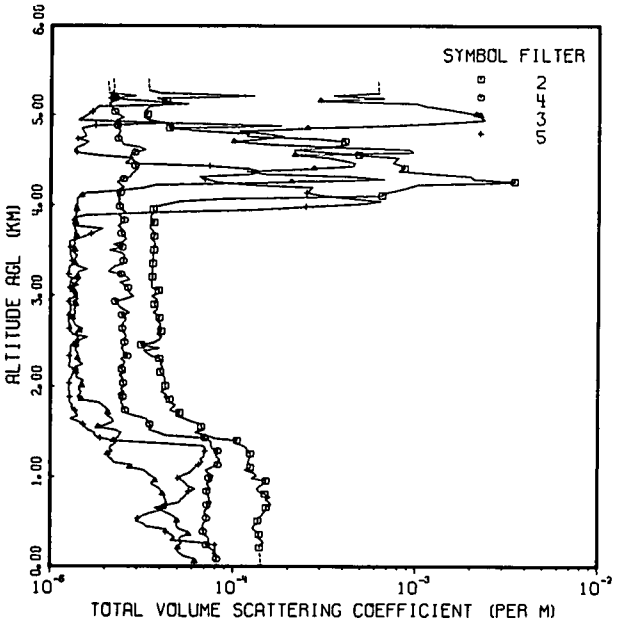
Spaichinger, 28 kilometers southwest of the track center, observed 1/8 stratocumulus at 750 meters (2500 feet) and 3/8 to 5/8 cirrus at 6600 to 6900 meters (22,000 to 23,000 feet) with visibilities 60 to 75 kilometers.

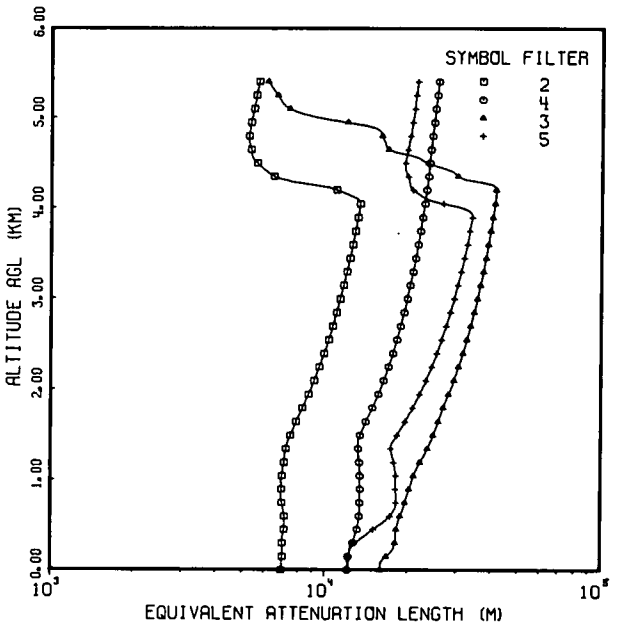
Ulm, 68 kilometers eastnortheast of the track center, reported 2/8 to 4/8 cirrus cloud at 6000 meters (20,000 feet) with visibility 15.0 kilometers.

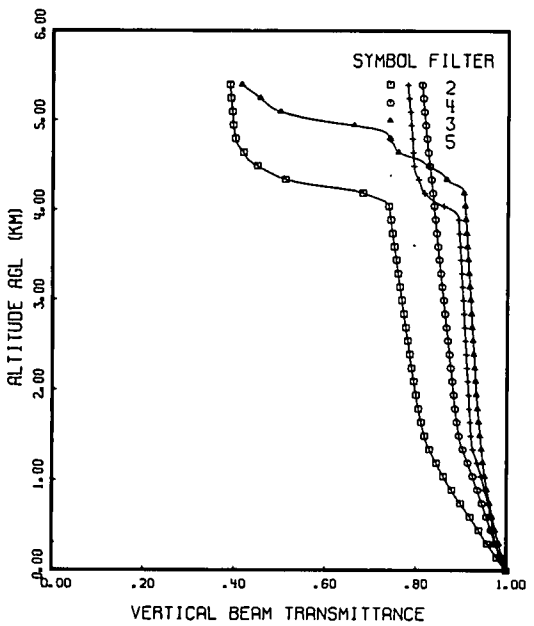
The radiosonde station at Neuchatel was 225 kilometers southwest of the track and in a parallel flow. The vertical cross section for 1200 GMT indicated 4/8 clouds from 6600 to 8000 meters.

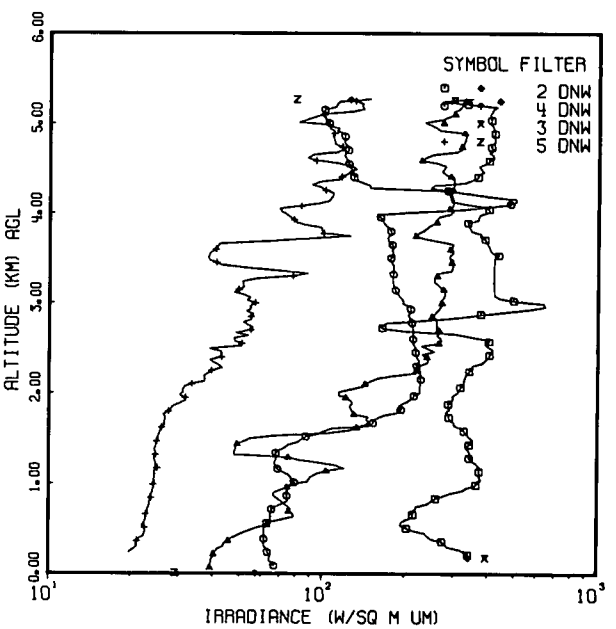
Synoptic Remarks. On the surface chart there was an occluded front from the North Sea into East Germany and to Prague. A stationary front extended from Prague to Munich, Bern, the Balearics and southwest to Africa. The flight path was in a col west of the front and there was a weak gradient at the surface. At 500 millibars there was slight ridging from northern Italy northwest to southern England. There were southsouthwesterly winds at this level. The air mass was modified maritime polar.

FLIGHT NO. C-441
BIRKHOF









FLIGHT NO. C-441
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6546 DATE 03/29/79)
DATE 30378 FLIGHT NO. C-441 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(1.43E-04)	(8.25E-05)	(6.26E-05)	(8.18E-05)
30	(1.43E-04)	(8.21E-05)	(6.23E-05)	(8.14E-05)
60	(1.42E-04)	(8.19E-05)	6.21E-05	(8.12E-05)
90	(1.42E-04)	8.17E-05	6.20E-05	(8.10E-05)
120	(1.42E-04)	8.34E-05	5.41E-05	(8.08E-05)
150	(1.41E-04)	7.81E-05	5.14E-05	(8.06E-05)
180	(1.41E-04)	8.02E-05	4.97E-05	(8.04E-05)
210	1.41E-04	7.51E-05	5.04E-05	(8.02E-05)
240	1.42E-04	7.16E-05	5.10E-05	8.00E-05
270	1.48E-04	7.44E-05	5.26E-05	6.91E-05
300	1.44E-04	7.37E-05	5.13E-05	4.57E-05
330	1.37E-04	7.35E-05	5.17E-05	4.82E-05
360	1.40E-04	6.96E-05	5.73E-05	4.59E-05
390	1.36E-04	6.90E-05	5.74E-05	4.30E-05
420	1.30E-04	6.90E-05	5.10E-05	4.34E-05
450	1.30E-04	6.89E-05	4.95E-05	3.37E-05
480	1.36E-04	6.92E-05	4.96E-05	3.25E-05
510	1.37E-04	7.16E-05	4.97E-05	2.95E-05
540	1.37E-04	7.18E-05	4.92E-05	3.02E-05
570	1.45E-04	7.32E-05	4.70E-05	3.22E-05
600	1.47E-04	7.02E-05	4.40E-05	3.51E-05
630	1.52E-04	7.08E-05	4.07E-05	4.06E-05
660	1.53E-04	7.43E-05	4.15E-05	3.73E-05
690	1.63E-04	7.23E-05	4.22E-05	4.32E-05
720	1.60E-04	7.70E-05	4.36E-05	5.11E-05
750	1.51E-04	7.40E-05	4.28E-05	5.22E-05
780	1.61E-04	7.44E-05	4.21E-05	5.44E-05
810	1.50E-04	7.25E-05	4.14E-05	5.59E-05
840	1.39E-04	7.18E-05	4.07E-05	5.73E-05
870	1.36E-04	7.58E-05	3.99E-05	6.26E-05
900	1.40E-04	7.34E-05	3.80E-05	5.68E-05
930	1.50E-04	7.19E-05	3.55E-05	5.58E-05
960	1.52E-04	7.65E-05	3.76E-05	5.33E-05
990	1.27E-04	7.38E-05	3.82E-05	5.02E-05
1020	1.35E-04	7.87E-05	3.54E-05	5.29E-05
1050	1.29E-04	7.30E-05	3.40E-05	5.83E-05
1080	1.16E-04	7.10E-05	3.26E-05	6.03E-05
1110	1.25E-04	7.69E-05	2.73E-05	6.24E-05
1140	1.25E-04	8.29E-05	2.84E-05	6.49E-05
1170	1.21E-04	8.23E-05	2.23E-05	6.91E-05
1200	1.24E-04	8.56E-05	2.18E-05	6.64E-05
1230	1.25E-04	8.13E-05	2.08E-05	6.93E-05
1260	1.25E-04	8.20E-05	2.06E-05	6.97E-05
1290	1.19E-04	8.28E-05	2.19E-05	7.06E-05
1320	1.20E-04	7.71E-05	2.11E-05	7.07E-05
1350	1.14E-04	7.61E-05	2.15E-05	6.90E-05
1380	1.02E-04	7.65E-05	2.29E-05	4.11E-05
1410	1.05E-04	7.50E-05	2.22E-05	2.30E-05
1440	7.84E-05	7.02E-05	2.33E-05	1.88E-05
1470	7.08E-05	4.27E-05	2.40E-05	1.75E-05
1500	6.16E-05	3.87E-05	2.46E-05	1.75E-05

FLIGHT NO. C-441
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6546 DATE 03/29/79)
DATE 30378 FLIGHT NO. C-441 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M)			
FILTERS	2	4	3	5
1530	6.98E-05	3.47E-05	2.26E-05	1.60E-05
1560	6.70E-05	3.63E-05	1.83E-05	1.55E-05
1590	6.70E-05	3.50E-05	2.07E-05	1.51E-05
1620	5.89E-05	3.39E-05	2.23E-05	1.43E-05
1650	5.44E-05	3.39E-05	2.13E-05	1.28E-05
1680	4.85E-05	2.94E-05	2.06E-05	1.41E-05
1710	5.10E-05	2.60E-05	2.08E-05	1.39E-05
1740	4.51E-05	2.57E-05	2.09E-05	1.37E-05
1770	4.71E-05	2.50E-05	2.01E-05	1.30E-05
1800	4.84E-05	2.51E-05	1.93E-05	1.33E-05
1830	4.46E-05	2.44E-05	1.85E-05	1.28E-05
1860	4.51E-05	2.49E-05	1.48E-05	1.28E-05
1890	4.22E-05	2.50E-05	1.40E-05	1.27E-05
1920	4.32E-05	2.35E-05	1.46E-05	1.27E-05
1950	4.03E-05	2.54E-05	1.48E-05	1.27E-05
1980	4.28E-05	2.43E-05	1.45E-05	1.26E-05
2010	4.26E-05	2.55E-05	1.49E-05	1.27E-05
2040	4.25E-05	2.51E-05	1.47E-05	1.27E-05
2070	4.24E-05	2.47E-05	1.52E-05	1.27E-05
2100	4.24E-05	2.50E-05	1.39E-05	1.30E-05
2130	4.17E-05	2.38E-05	1.40E-05	1.32E-05
2160	4.00E-05	2.59E-05	1.37E-05	1.34E-05
2190	4.07E-05	2.46E-05	1.39E-05	1.37E-05
2220	4.13E-05	2.37E-05	1.39E-05	1.26E-05
2250	4.01E-05	2.53E-05	1.51E-05	1.27E-05
2280	4.17E-05	2.56E-05	1.42E-05	1.29E-05
2310	3.95E-05	2.42E-05	1.41E-05	1.28E-05
2340	3.55E-05	2.64E-05	1.42E-05	1.27E-05
2370	3.40E-05	2.53E-05	1.41E-05	1.29E-05
2400	3.25E-05	2.52E-05	1.38E-05	1.29E-05
2430	3.96E-05	2.46E-05	1.39E-05	1.30E-05
2460	3.15E-05	2.55E-05	1.39E-05	1.30E-05
2490	3.73E-05	2.55E-05	1.41E-05	1.38E-05
2520	3.95E-05	2.53E-05	1.41E-05	1.47E-05
2550	4.07E-05	2.59E-05	1.43E-05	1.60E-05
2580	3.83E-05	2.58E-05	1.38E-05	1.32E-05
2610	4.06E-05	2.49E-05	1.44E-05	1.30E-05
2640	3.86E-05	2.48E-05	1.51E-05	1.27E-05
2670	4.03E-05	2.46E-05	1.39E-05	1.30E-05
2700	3.99E-05	2.51E-05	1.35E-05	1.26E-05
2730	3.82E-05	2.58E-05	1.33E-05	1.26E-05
2760	3.96E-05	2.58E-05	1.33E-05	1.26E-05
2790	3.89E-05	2.46E-05	1.36E-05	1.27E-05
2820	3.65E-05	2.73E-05	1.37E-05	1.28E-05
2850	3.87E-05	2.53E-05	1.34E-05	1.29E-05
2880	3.80E-05	2.39E-05	1.38E-05	1.29E-05
2910	3.70E-05	2.34E-05	1.37E-05	1.29E-05
2940	3.87E-05	2.26E-05	1.32E-05	1.26E-05
2970	3.80E-05	2.58E-05	1.42E-05	1.28E-05
3000	3.57E-05	2.87E-05	1.35E-05	1.41E-05

FLIGHT NO. C-441
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6546 DATE 03/29/79)
DATE 30378 FLIGHT NO. C-441 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	3.96E-05	2.71E-05	1.40E-05	1.33E-05
3060	3.91E-05	2.68E-05	1.33E-05	1.38E-05
3090	3.59E-05	2.66E-05	1.23E-05	1.28E-05
3120	3.60E-05	2.53E-05	1.43E-05	1.34E-05
3150	3.60E-05	2.40E-05	1.28E-05	1.39E-05
3180	3.60E-05	2.71E-05	1.31E-05	1.44E-05
3210	3.61E-05	2.61E-05	1.41E-05	1.25E-05
3240	3.61E-05	2.44E-05	1.42E-05	1.26E-05
3270	3.62E-05	2.08E-05	1.42E-05	1.26E-05
3300	3.63E-05	2.16E-05	1.60E-05	1.27E-05
3330	3.64E-05	2.25E-05	1.41E-05	1.28E-05
3360	3.64E-05	2.51E-05	1.36E-05	1.36E-05
3390	3.65E-05	2.51E-05	1.36E-05	1.32E-05
3420	3.66E-05	2.51E-05	1.36E-05	1.30E-05
3450	3.67E-05	2.56E-05	1.41E-05	1.29E-05
3480	3.67E-05	2.47E-05	1.35E-05	1.29E-05
3510	3.68E-05	2.10E-05	1.36E-05	1.29E-05
3540	3.70E-05	2.49E-05	1.32E-05	1.29E-05
3570	3.72E-05	2.22E-05	1.37E-05	1.28E-05
3600	3.72E-05	2.50E-05	1.35E-05	1.26E-05
3630	3.59E-05	2.61E-05	1.36E-05	1.40E-05
3660	3.69E-05	2.54E-05	1.40E-05	1.53E-05
3690	3.79E-05	2.45E-05	1.36E-05	1.67E-05
3720	3.62E-05	2.52E-05	1.39E-05	1.81E-05
3750	3.51E-05	2.43E-05	1.35E-05	1.94E-05
3780	3.51E-05	2.35E-05	1.37E-05	1.34E-05
3810	3.69E-05	2.49E-05	1.38E-05	1.34E-05
3840	3.61E-05	2.54E-05	1.37E-05	1.35E-05
3870	3.53E-05	2.46E-05	1.38E-05	1.36E-05
3900	3.58E-05	2.37E-05	1.37E-05	1.59E-05
3930	3.73E-05	2.59E-05	1.39E-05	3.60E-05
3960	3.65E-05	2.44E-05	1.40E-05	1.30E-04
3990	3.66E-05	2.39E-05	1.36E-05	2.48E-04
4020	4.41E-05	2.43E-05	1.41E-05	4.88E-04
4050	5.19E-05	2.37E-05	1.40E-05	6.42E-04
4080	8.82E-05	2.41E-05	1.40E-05	4.40E-04
4110	6.49E-04	2.30E-05	1.49E-05	3.10E-04
4140	6.79E-04	2.42E-05	1.57E-05	2.50E-04
4170	7.95E-04	2.35E-05	2.43E-05	2.60E-04
4200	9.11E-04	2.52E-05	3.28E-05	2.70E-04
4230	1.03E-03	2.42E-05	3.80E-05	1.16E-04
4260	3.46E-03	2.30E-05	2.06E-04	8.09E-05
4290	2.05E-03	2.51E-05	6.66E-04	6.97E-05
4320	1.99E-03	2.74E-05	4.37E-04	6.51E-05
4350	1.25E-03	2.80E-05	1.47E-04	1.26E-04
4380	7.97E-04	2.89E-05	1.18E-04	1.39E-04
4410	8.61E-04	3.01E-05	2.74E-04	1.20E-04
4440	8.45E-04	2.90E-05	4.54E-04	7.42E-05
4470	7.42E-04	3.02E-05	4.61E-04	2.55E-05
4500	7.72E-04	2.82E-05	3.95E-04	2.68E-05

FLIGHT NO. C-441
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6546 DATE 03/29/79)
DATE 30378 FLIGHT NO. C-441 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
4530	8.01E-04	2.75E-05	3.28E-04	2.80E-05
4560	4.83E-04	2.75E-05	2.15E-04	1.79E-05
4590	3.24E-04	2.90E-05	9.63E-04	1.39E-05
4620	2.13E-04	3.33E-05	9.17E-04	1.35E-05
4650	3.20E-04	3.05E-05	3.51E-04	1.40E-05
4680	4.20E-04	2.40E-05	1.55E-04	1.54E-05
4710	4.07E-04	2.44E-05	1.00E-04	1.61E-05
4740	2.90E-04	2.34E-05	1.42E-04	1.41E-05
4770	1.18E-04	2.38E-05	1.88E-04	1.57E-05
4800	1.21E-04	2.35E-05	1.47E-04	1.54E-05
4830	6.83E-05	2.41E-05	1.07E-04	1.50E-05
4860	4.46E-05	2.34E-05	2.53E-04	1.47E-05
4890	1.82E-04	2.31E-05	7.10E-04	1.75E-05
4920	4.07E-05	2.28E-05	1.44E-03	4.30E-05
4950	3.42E-05	2.31E-05	2.36E-03	1.41E-05
4980	3.20E-05	2.50E-05	2.24E-03	1.51E-05
5010	3.37E-05	2.32E-05	2.13E-03	1.61E-05
5040	3.27E-05	2.23E-05	1.78E-03	1.68E-05
5070	3.37E-05	2.19E-05	1.45E-03	1.76E-05
5100	3.48E-05	2.15E-05	1.13E-03	1.83E-05
5130	4.54E-05	2.08E-05	9.82E-04	5.65E-05
5160	4.27E-05	2.22E-05	2.96E-04	3.33E-05
5190	3.60E-05	2.24E-05	6.61E-04	2.13E-05
5220	1.30E-04	2.25E-05	3.51E-04	2.92E-05
5250	3.92E-05	2.18E-05	6.24E-04	2.08E-05
5280	3.44E-05	2.22E-05	(6.22E-04)	(2.07E-05)
5310	(3.43E-05)	(2.21E-05)	(6.20E-04)	(2.06E-05)
5340	(3.42E-05)	(2.21E-05)	(6.18E-04)	(2.06E-05)
5370	(3.41E-05)	(2.20E-05)	(6.16E-04)	(2.05E-05)
5400	(3.39E-05)	(2.19E-05)	(6.14E-04)	(2.04E-05)
FIRST DATA ALT	210	90	60	240
LAST DATA ALT	5280	5280	5250	5250

FLIGHT NO. C-441
EQUIVALENT ATTENUATION LENGTH

(JOB 6546 DATE 03/29/79)
DATE 30378 FLIGHT NO. C-441 GROUND LEVEL ALTITUDE (M)= 762

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(6.97E 03)	(1.21E 04)	(1.60E 04)	(1.22E 04)
300	7.02E 03	1.27E 04	1.81E 04	1.28E 04
600	7.15E 03	1.34E 04	1.88E 04	1.73E 04
900	6.97E 03	1.35E 04	2.03E 04	1.81E 04
1200	7.12E 03	1.34E 04	2.22E 04	1.78E 04
1500	7.49E 03	1.34E 04	2.47E 04	1.83E 04
1800	8.29E 03	1.49E 04	2.69E 04	2.08E 04
2100	9.13E 03	1.64E 04	2.94E 04	2.33E 04
2400	9.93E 03	1.77E 04	3.17E 04	2.55E 04
2700	1.07E 04	1.88E 04	3.38E 04	2.75E 04
3000	1.13E 04	1.99E 04	3.57E 04	2.94E 04
3300	1.20E 04	2.08E 04	3.74E 04	3.11E 04
3600	1.26E 04	2.17E 04	3.90E 04	3.27E 04
3900	1.31E 04	2.25E 04	4.05E 04	3.41E 04
4200	1.09E 04	2.33E 04	4.15E 04	2.07E 04
4500	5.62E 03	2.39E 04	2.35E 04	1.94E 04
4800	5.25E 03	2.44E 04	1.60E 04	2.03E 04
5100	5.47E 03	2.50E 04	7.35E 03	2.10E 04
5400	(5.71E 03)	(2.57E 04)	(6.13E 03)	(2.16E 04)

FLIGHT NO. C-441
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

$\tau_R = 0.0340$

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.58E-01	9.77E-01	9.84E-01	9.77E-01
600	9.19E-01	9.56E-01	9.69E-01	9.66E-01
900	8.79E-01	9.35E-01	9.57E-01	9.51E-01
1200	8.45E-01	9.14E-01	9.47E-01	9.35E-01
1500	8.19E-01	8.94E-01	9.41E-01	9.21E-01
1800	8.05E-01	8.86E-01	9.35E-01	9.17E-01
2100	7.95E-01	8.79E-01	9.31E-01	9.14E-01
2400	7.85E-01	8.73E-01	9.27E-01	9.10E-01
2700	7.76E-01	8.66E-01	9.23E-01	9.06E-01
3000	7.67E-01	8.60E-01	9.19E-01	9.03E-01
3300	7.59E-01	8.53E-01	9.16E-01	8.99E-01
3600	7.51E-01	8.47E-01	9.12E-01	8.96E-01
3900	7.43E-01	8.41E-01	9.08E-01	8.92E-01
4200	6.81E-01	8.35E-01	9.04E-01	8.16E-01
4500	4.49E-01	8.28E-01	8.26E-01	7.93E-01
4800	4.01E-01	8.21E-01	7.40E-01	7.89E-01
5100	3.94E-01	8.16E-01	5.00E-01	7.85E-01
5400	(3.88E-01)	(8.10E-01)	(4.14E-01)	(7.78E-01)

FLIGHT C-442 - 9 MARCH 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2	1243	1301	0.30	57.5	-	58.2	4650	Sea Level
3	1303	1322	0.32	58.3	-	59.2	4620	Sea Level
4	1323	1346	0.38	59.3	-	60.8	4710	Sea Level
5	1347	1404	0.28	60.9	-	62.3	4710	Sea Level

Flight Description. Flight C-442 was a midday flight spanning local apparent noon with take off at 1014 and a stop at Yeovilton to drop off the ground station. There were overcast clouds. Adverse weather conditions over the Yeovilton track necessitated use of the alternate track farther northeast near Mildenhall. Data taking over this track was during the afternoon. The approximate east to west Mildenhall track was located 48 to 97 kilometers (30 to 60 miles) east of Mildenhall near the southeast coast of England. Typical terrain features were green fields and the brown colored water of the North Sea.

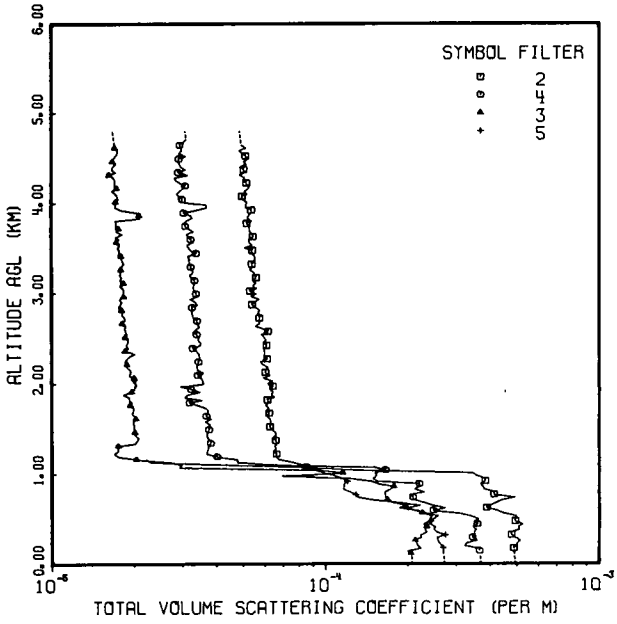
In-Flight Notes. The in-flight observer reported moderate haze with tops at 975 meters (3200 feet) very distinct; above 980 meters (3200 feet) there was thin haze but no apparent layering. At 1308 GMT stratus clouds were moving into the area from the west and there was heavy cirrus overhead; haze tops were 910 meters (3000 feet) and slant visibility 9.7 kilometers (6 miles). On the last descent there were scattered clouds at 850 meters (2800 feet) and thin overcast at 5500 meters (18,000 feet). Stratocumulus was moving in from the west and haze tops were less sharp. The haze top was entered at 1000 meters (3400 feet) and there was dense consistent haze at 940 meters (3100 feet).

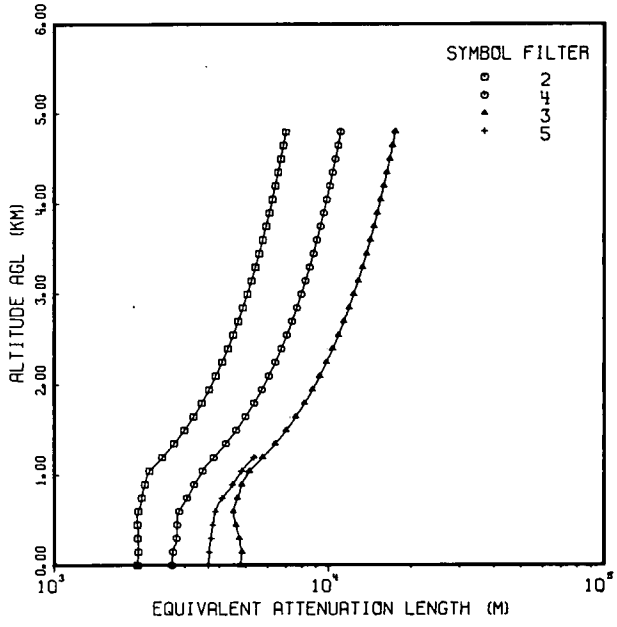
Local Weather Notes. Observations from stations on the south coast of England in the vicinity of the primary track indicate overcast stratus and stratocumulus clouds with ceilings 600 to 750 meters (200 to 2500 feet) and visibility 10 to 18 kilometers.

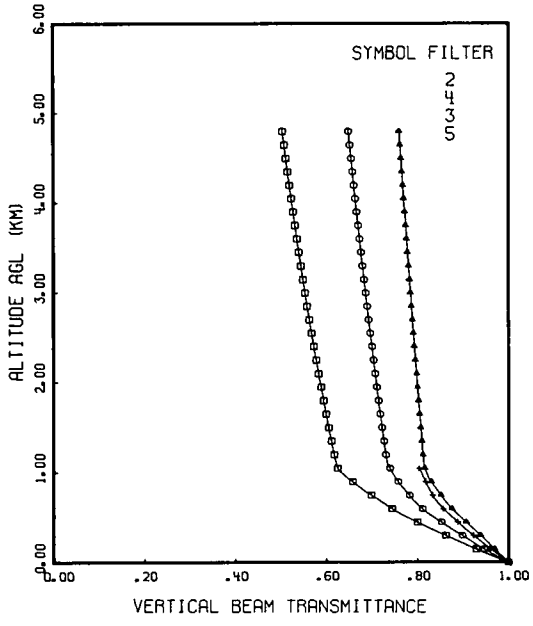
The radiosonde station at Crawley was 178 kilometers southwest and in an airflow parallel to the track. There was no appropriate vertical cross section.

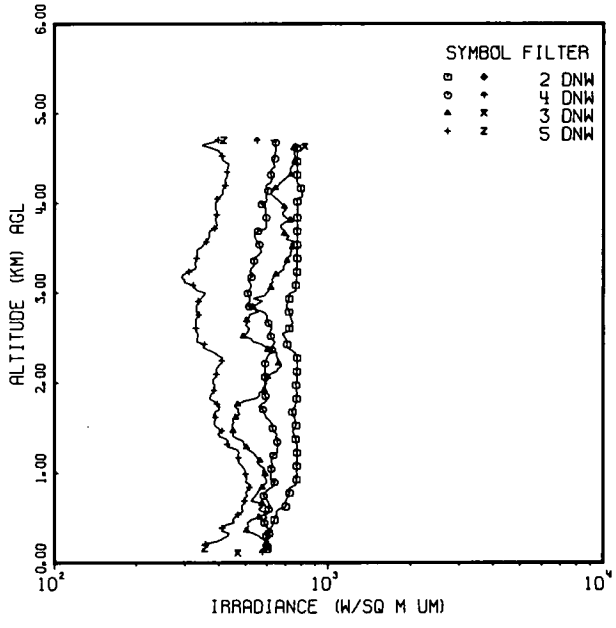
Synoptic Remarks. The surface chart showed that a ridge of high pressure covered Britain and the North Sea and a 1030 millibars high was centered near Paris. A warm front extended from Le Havre northwest through the Scilly Islands and western Ireland. There was southerly flow at the surface with pre-warm frontal low clouds over the track in southern England. At 500 millibars there was ridging from Spain through Britain to Iceland. The flow was northwesterly and the air mass was stable maritime polar.

FLIGHT NO. C-442
MILDENHALL









FLIGHT NO. C-442
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6555 DATE 03/29/79)
DATE 30978 FLIGHT NO. C-442 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(4.96E-04)	(3.71E-04)	(2.09E-04)	(2.74E-04)
30	(4.94E-04)	(3.70E-04)	(2.07E-04)	(2.72E-04)
60	(4.93E-04)	(3.69E-04)	(2.07E-04)	(2.72E-04)
90	(4.92E-04)	(3.68E-04)	(2.06E-04)	(2.71E-04)
120	(4.90E-04)	(3.67E-04)	2.06E-04	(2.70E-04)
150	(4.89E-04)	3.66E-04	1.99E-04	(2.70E-04)
180	4.88E-04	3.65E-04	2.23E-04	2.69E-04
210	4.98E-04	3.23E-04	2.17E-04	2.66E-04
240	5.03E-04	3.29E-04	2.16E-04	2.61E-04
270	5.16E-04	3.59E-04	2.12E-04	2.58E-04
300	4.94E-04	3.45E-04	2.24E-04	2.55E-04
330	4.79E-04	3.52E-04	2.23E-04	2.74E-04
360	4.75E-04	3.50E-04	2.35E-04	2.55E-04
390	5.12E-04	3.55E-04	2.31E-04	2.48E-04
420	5.06E-04	3.46E-04	2.35E-04	2.53E-04
450	5.27E-04	3.59E-04	2.28E-04	2.40E-04
480	4.93E-04	3.50E-04	2.40E-04	2.43E-04
510	4.98E-04	3.63E-04	2.41E-04	2.49E-04
540	4.99E-04	3.38E-04	2.46E-04	2.59E-04
570	4.46E-04	3.06E-04	2.27E-04	2.33E-04
600	4.24E-04	2.48E-04	2.18E-04	2.12E-04
630	3.88E-04	2.75E-04	1.86E-04	2.00E-04
660	4.00E-04	2.45E-04	1.98E-04	2.22E-04
690	4.21E-04	2.29E-04	1.76E-04	1.88E-04
720	4.40E-04	2.11E-04	1.69E-04	1.51E-04
750	4.93E-04	2.09E-04	1.66E-04	1.32E-04
780	4.15E-04	2.02E-04	1.66E-04	1.29E-04
810	4.16E-04	2.30E-04	1.65E-04	1.23E-04
840	3.80E-04	2.12E-04	1.73E-04	1.17E-04
870	3.76E-04	2.21E-04	1.78E-04	1.17E-04
900	3.69E-04	2.21E-04	1.56E-04	1.17E-04
930	3.84E-04	1.54E-04	1.47E-04	1.20E-04
960	3.82E-04	1.49E-04	1.24E-04	1.15E-04
990	3.56E-04	1.54E-04	6.94E-05	1.08E-04
1020	3.45E-04	1.52E-04	1.16E-04	9.87E-05
1050	1.35E-04	1.66E-04	9.58E-05	9.16E-05
1080	8.52E-05	1.52E-04	2.92E-05	8.45E-05
1110	8.25E-05	6.57E-05	2.99E-05	4.38E-05
1140	7.53E-05	4.77E-05	2.67E-05	2.29E-05
1170	6.73E-05	4.78E-05	2.04E-05	2.22E-05
1200	6.61E-05	4.02E-05	1.75E-05	(2.21E-05)
1230	6.62E-05	3.70E-05	1.69E-05	
1260	6.49E-05	3.72E-05	1.75E-05	
1290	6.59E-05	3.74E-05	1.75E-05	
1320	6.54E-05	3.74E-05	1.75E-05	
1350	6.66E-05	3.82E-05	2.03E-05	
1380	6.58E-05	3.84E-05	2.06E-05	
1410	6.44E-05	3.71E-05	2.08E-05	
1440	6.59E-05	3.72E-05	2.02E-05	
1470	6.57E-05	3.70E-05	2.02E-05	
1500	6.43E-05	3.77E-05	2.00E-05	

FLIGHT NO. C-442
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6555 DATE 03/29/79)
DATE 30978 FLIGHT NO. C-442 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	6.28E-05	3.78E-05	2.01E-05	
1560	6.35E-05	3.80E-05	2.00E-05	
1590	6.30E-05	3.65E-05	2.00E-05	
1620	6.27E-05	3.84E-05	2.04E-05	
1650	6.08E-05	3.68E-05	2.01E-05	
1680	6.23E-05	3.71E-05	1.97E-05	
1710	6.06E-05	3.74E-05	2.00E-05	
1740	6.22E-05	3.67E-05	2.00E-05	
1770	6.03E-05	3.44E-05	1.94E-05	
1800	6.23E-05	3.19E-05	1.97E-05	
1830	6.14E-05	3.55E-05	1.93E-05	
1860	6.51E-05	3.06E-05	1.93E-05	
1890	6.35E-05	3.16E-05	1.83E-05	
1920	6.43E-05	3.50E-05	1.96E-05	
1950	6.26E-05	3.23E-05	2.01E-05	
1980	6.42E-05	2.95E-05	2.02E-05	
2010	6.15E-05	3.61E-05	2.04E-05	
2040	6.41E-05	3.57E-05	1.98E-05	
2070	5.94E-05	3.54E-05	2.01E-05	
2100	6.28E-05	3.43E-05	1.92E-05	
2130	6.04E-05	3.61E-05	1.95E-05	
2160	6.06E-05	3.42E-05	1.94E-05	
2190	6.18E-05	3.41E-05	1.88E-05	
2220	5.90E-05	3.41E-05	1.89E-05	
2250	5.80E-05	3.45E-05	1.85E-05	
2280	6.12E-05	3.50E-05	1.88E-05	
2310	6.01E-05	3.47E-05	1.92E-05	
2340	6.02E-05	3.46E-05	2.02E-05	
2370	5.98E-05	3.40E-05	1.86E-05	
2400	5.99E-05	3.28E-05	1.91E-05	
2430	6.08E-05	3.50E-05	1.88E-05	
2460	5.95E-05	3.52E-05	1.90E-05	
2490	6.07E-05	3.44E-05	1.91E-05	
2520	5.96E-05	3.46E-05	1.86E-05	
2550	5.85E-05	3.39E-05	1.90E-05	
2580	6.17E-05	3.29E-05	1.87E-05	
2610	5.94E-05	3.41E-05	1.85E-05	
2640	5.55E-05	3.47E-05	1.87E-05	
2670	5.73E-05	3.40E-05	1.81E-05	
2700	5.73E-05	3.40E-05	1.85E-05	
2730	5.73E-05	3.31E-05	1.85E-05	
2760	5.83E-05	3.28E-05	1.82E-05	
2790	5.65E-05	3.26E-05	1.81E-05	
2820	5.76E-05	3.26E-05	1.81E-05	
2850	5.55E-05	3.27E-05	1.76E-05	
2880	5.39E-05	3.42E-05	1.78E-05	
2910	5.55E-05	3.36E-05	1.81E-05	
2940	5.74E-05	3.20E-05	1.77E-05	
2970	5.33E-05	3.42E-05	1.84E-05	
3000	5.59E-05	3.37E-05	1.86E-05	

FLIGHT NO. C-442
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6555 DATE 03/29/79)
DATE 30978 FLIGHT NO. C-442 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	5.30E-05	3.34E-05	1.84E-05	
3060	5.61E-05	3.30E-05	1.83E-05	
3090	5.42E-05	3.31E-05	1.78E-05	
3120	5.59E-05	3.33E-05	1.84E-05	
3150	5.41E-05	3.33E-05	1.78E-05	
3180	5.57E-05	3.26E-05	1.81E-05	
3210	5.53E-05	3.20E-05	1.78E-05	
3240	5.49E-05	3.30E-05	1.79E-05	
3270	5.29E-05	3.27E-05	1.80E-05	
3300	5.42E-05	3.23E-05	1.80E-05	
3330	5.36E-05	3.21E-05	1.84E-05	
3360	5.52E-05	3.19E-05	1.82E-05	
3390	5.50E-05	3.20E-05	1.80E-05	
3420	5.50E-05	3.15E-05	1.80E-05	
3450	5.37E-05	3.38E-05	1.76E-05	
3480	5.40E-05	3.23E-05	1.78E-05	
3510	5.06E-05	3.18E-05	1.75E-05	
3540	5.40E-05	3.13E-05	1.78E-05	
3570	5.26E-05	3.29E-05	1.73E-05	
3600	5.24E-05	3.22E-05	1.77E-05	
3630	5.44E-05	3.14E-05	1.72E-05	
3660	5.40E-05	3.12E-05	1.82E-05	
3690	5.30E-05	3.30E-05	1.72E-05	
3720	5.28E-05	3.18E-05	1.76E-05	
3750	5.30E-05	3.08E-05	1.73E-05	
3780	5.16E-05	3.08E-05	1.72E-05	
3810	5.38E-05	3.10E-05	1.71E-05	
3840	5.17E-05	3.27E-05	2.11E-05	
3870	5.25E-05	3.22E-05	2.09E-05	
3900	5.36E-05	3.04E-05	2.07E-05	
3930	5.36E-05	3.38E-05	1.80E-05	
3960	5.10E-05	3.69E-05	1.71E-05	
3990	5.14E-05	3.66E-05	1.71E-05	
4020	5.18E-05	2.98E-05	1.71E-05	
4050	4.96E-05	3.00E-05	1.76E-05	
4080	4.96E-05	2.92E-05	1.74E-05	
4110	5.17E-05	2.86E-05	1.72E-05	
4140	5.07E-05	2.95E-05	1.66E-05	
4170	5.25E-05	3.01E-05	1.73E-05	
4200	5.21E-05	3.08E-05	1.70E-05	
4230	5.15E-05	2.95E-05	1.71E-05	
4260	5.04E-05	2.85E-05	1.71E-05	
4290	5.09E-05	2.81E-05	1.69E-05	
4320	4.87E-05	3.15E-05	1.63E-05	
4350	5.10E-05	2.90E-05	1.72E-05	
4380	5.03E-05	3.09E-05	1.66E-05	
4410	4.91E-05	2.97E-05	1.68E-05	
4440	5.14E-05	2.94E-05	1.72E-05	
4470	5.04E-05	2.91E-05	1.67E-05	
4500	5.22E-05	2.92E-05	1.68E-05	

FLIGHT NO. C-442
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6555 DATE 03/29/79)
DATE 30978 FLIGHT NO. C-442 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
4530	5.11E-05	3.10E-05	1.71E-05	
4560	5.01E-05	2.91E-05	1.74E-05	
4590	4.84E-05	3.00E-05	1.74E-05	
4620	5.15E-05	2.97E-05	1.70E-05	
4650	4.94E-05	2.94E-05	(1.70E-05)	
4680	(4.93E-05)	3.02E-05	(1.69E-05)	
4710	(4.91E-05)	3.10E-05	(1.69E-05)	
4740	(4.90E-05)	(3.09E-05)	(1.68E-05)	
4770	(4.88E-05)	(3.08E-05)	(1.68E-05)	
4800	(4.87E-05)	(3.07E-05)	(1.67E-05)	
FIRST DATA ALT	180	150	120	180
LAST DATA ALT	4650	4710	4620	1170

FLIGHT NO. C-442
EQUIVALENT ATTENUATION LENGTH

(JOB 6555 DATE 03/29/79)
DATE 30978 FLIGHT NO. C-442 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(2.01E 03)	(2.69E 03)	(4.80E 03)	(3.65E 03)
300	2.02E 03	2.80E 03	4.74E 03	3.74E 03
600	2.03E 03	2.86E 03	4.51E 03	3.88E 03
900	2.15E 03	3.24E 03	4.84E 03	4.48E 03
1200	2.48E 03	3.82E 03	5.76E 03	(5.35E 03)
1500	2.98E 03	4.61E 03	7.01E 03	
1800	3.45E 03	5.35E 03	8.18E 03	
2100	3.69E 03	6.06E 03	9.30E 03	
2400	4.30E 03	6.72E 03	1.04E 04	
2700	4.69E 03	7.35E 03	1.14E 04	
3000	5.06E 03	7.96E 03	1.24E 04	
3300	5.41E 03	8.53E 03	1.33E 04	
3600	5.75E 03	9.08E 03	1.42E 04	
3900	6.08E 03	9.60E 03	1.51E 04	
4200	6.39E 03	1.01E 04	1.59E 04	
4500	6.70E 03	1.06E 04	1.67E 04	
4800	(6.99E 03)	(1.11E 04)	(1.75E 04)	
5100				
5400				
5700				

FLIGHT NO. C-442
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

$\tau_{R_1} = 0.0475$

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	8.62E-01	8.98E-01	9.39E-01	9.23E-01
600	7.44E-01	8.11E-01	8.75E-01	8.57E-01
900	6.58E-01	7.58E-01	8.30E-01	8.18E-01
1200	6.17E-01	7.30E-01	8.12E-01	(7.99E-01)
1500	6.05E-01	7.22E-01	8.07E-01	
1800	5.94E-01	7.14E-01	8.03E-01	
2100	5.83E-01	7.07E-01	7.98E-01	
2400	5.72E-01	7.00E-01	7.93E-01	
2700	5.62E-01	6.93E-01	7.89E-01	
3000	5.53E-01	6.86E-01	7.85E-01	
3300	5.44E-01	6.79E-01	7.80E-01	
3600	5.35E-01	6.73E-01	7.76E-01	
3900	5.27E-01	6.66E-01	7.72E-01	
4200	5.18E-01	6.60E-01	7.68E-01	
4500	5.11E-01	6.54E-01	7.64E-01	
4800	(5.03E-01)	(6.48E-01)	(7.60E-01)	
5100				
5400				
5700				

FLIGHT C-443 - 9 MARCH 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	1413	1453	0.67	63.1	-	67.2	930	Sea Level
4,5	1459	1537	0.63	67.9	-	72.5	930	Sea Level

Flight Description. Flight C-443 was an afternoon flight with data tape beginning at 1410 and landing at 1600 GMT. There were thin overcast clouds. The approximate east to west Mildenhall track was located east of Mildenhall near the southeast coast of England. Typical terrain features were green fields and the brown colored water of the North Sea.

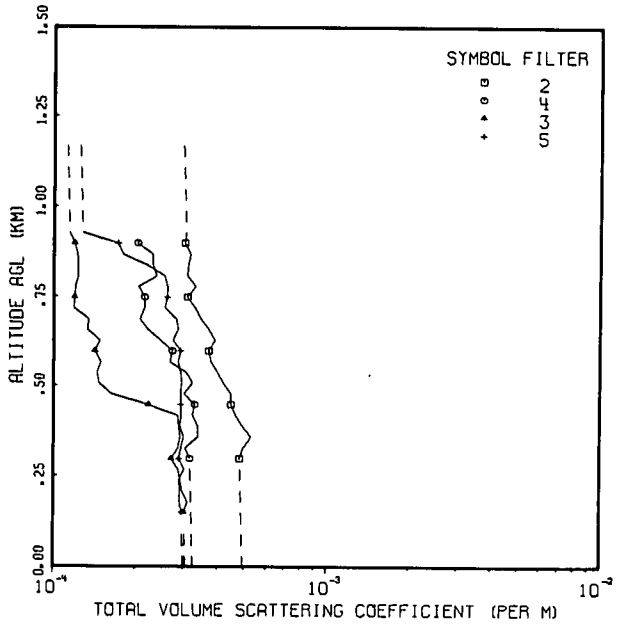
In-Flight Notes. The in-flight observer reported scattered stratocumulus at 910 meters (3000 feet) and thin overcast cirrus at 5500 meters (18,000 feet) at 1410 GMT. The stratocumulus was moving in slowly from the west. The top of a gray-brown haze layer was 910 meters (3000 feet). By 1500 GMT the flight was forced to the east to avoid the stratocumulus clouds. Slant range visibility was 6.4-8 kilometers (4-5 miles) and possibly a little better over the water. At 1518 GMT denser cirrus was approaching, the stratocumulus was moving east and the haze was denser near the leading edge. At 1527 GMT there was denser cirrus to the west.

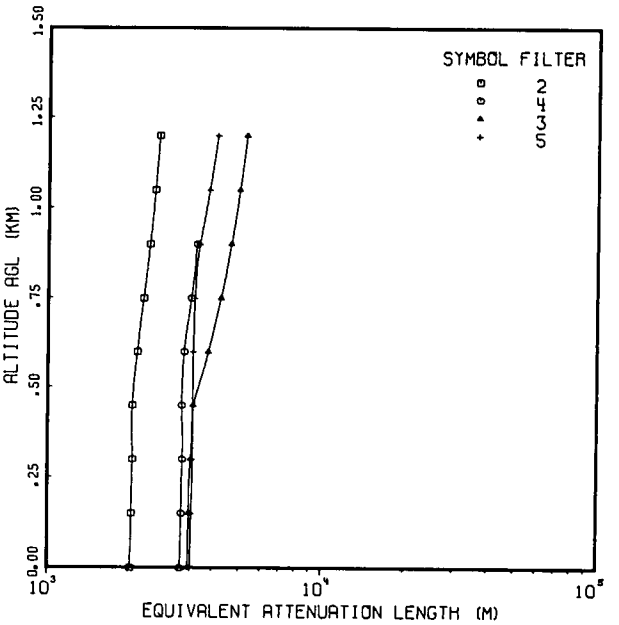
Local Weather Notes. Observations from stations on the south coast of England in the vicinity of the primary track indicate overcast stratocumulus clouds with ceiling 390 to 600 meters (1300 to 2000 feet) and visibility 10 to 18 kilometers.

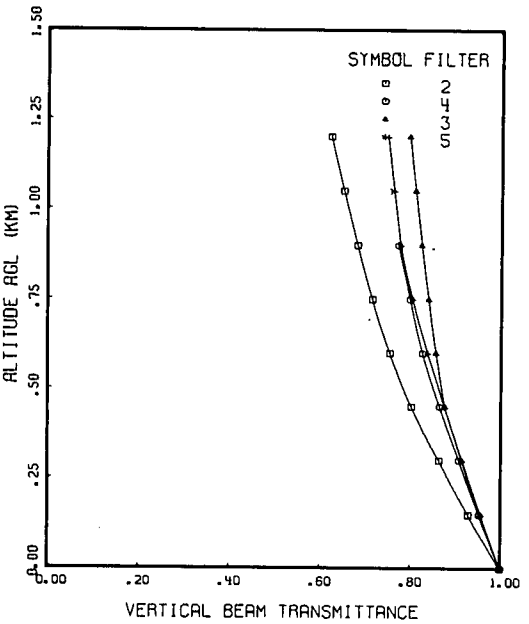
The radiosonde station at Crawley was 178 kilometers southwest and in an airflow parallel to the track. There was no appropriate cross section.

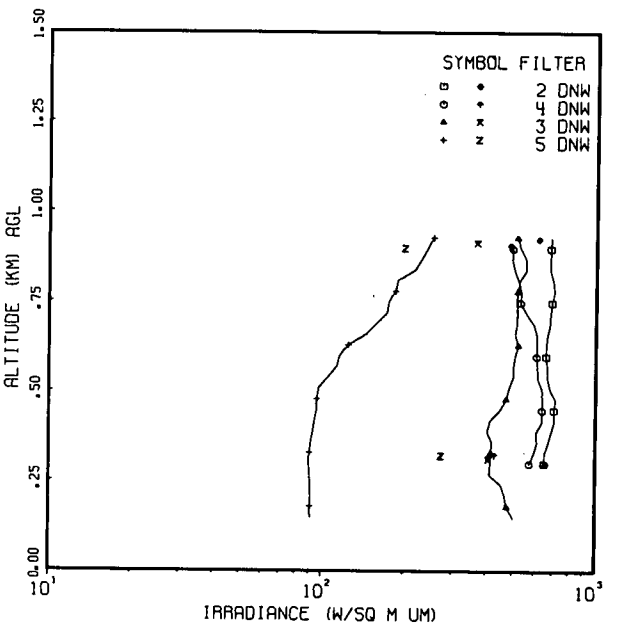
Synoptic Remarks. The surface chart showed that a ridge of high pressure covered Britain and the North Sea and a 1030 millibars high was centered near Paris. A warm front extended from Le Havre northwest through the Scilly Islands and western Ireland. There was southerly flow at the surface with pre-warm frontal low clouds over the track in southern England. At 500 millibars there was ridging from Spain through Britain to Iceland. The flow was northwesterly and the air mass was stable maritime polar.

FLIGHT NO. C-443
MILDENHALL









FLIGHT NO. C-443
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6561 DATE 03/29/79)
DATE 30978 FLIGHT NO. C-443 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(4.96E-04)	(3.26E-04)	(3.06E-04)	(3.00E-04)
30	(4.93E-04)	(3.24E-04)	(3.04E-04)	(2.98E-04)
60	(4.92E-04)	(3.23E-04)	(3.04E-04)	(2.98E-04)
90	(4.91E-04)	(3.23E-04)	(3.03E-04)	(2.97E-04)
120	(4.90E-04)	(3.22E-04)	(3.02E-04)	(2.96E-04)
150	(4.88E-04)	(3.21E-04)	3.01E-04	2.96E-04
180	(4.87E-04)	(3.20E-04)	3.11E-04	2.90E-04
210	(4.86E-04)	(3.19E-04)	2.97E-04	2.91E-04
240	(4.85E-04)	(3.18E-04)	2.92E-04	2.88E-04
270	(4.83E-04)	(3.18E-04)	2.87E-04	3.02E-04
300	4.82E-04	3.17E-04	2.71E-04	2.89E-04
330	4.97E-04	3.05E-04	2.87E-04	2.94E-04
360	5.30E-04	3.39E-04	2.92E-04	3.00E-04
390	4.95E-04	3.39E-04	2.89E-04	2.92E-04
420	4.66E-04	3.24E-04	2.86E-04	2.95E-04
450	4.48E-04	3.30E-04	2.24E-04	2.94E-04
480	4.47E-04	3.02E-04	1.63E-04	2.94E-04
510	4.19E-04	3.24E-04	1.47E-04	2.95E-04
540	4.00E-04	3.08E-04	1.45E-04	2.93E-04
570	3.78E-04	2.67E-04	1.49E-04	2.87E-04
600	3.70E-04	2.73E-04	1.42E-04	2.92E-04
630	3.90E-04	2.47E-04	1.48E-04	2.74E-04
660	3.71E-04	2.22E-04	1.33E-04	2.86E-04
690	3.48E-04	2.08E-04	1.35E-04	2.82E-04
720	3.30E-04	2.15E-04	1.18E-04	2.56E-04
750	3.09E-04	2.16E-04	1.19E-04	2.60E-04
780	3.31E-04	2.05E-04	1.20E-04	2.61E-04
810	3.09E-04	2.38E-04	1.23E-04	2.54E-04
840	3.11E-04	2.31E-04	1.23E-04	2.19E-04
870	3.17E-04	2.30E-04	1.22E-04	1.79E-04
900	3.02E-04	2.03E-04	1.19E-04	1.72E-04
930	3.05E-04		1.14E-04	1.27E-04
960	(3.04E-04)		(1.14E-04)	(1.27E-04)
990	(3.03E-04)		(1.14E-04)	(1.27E-04)
1020	(3.02E-04)		(1.13E-04)	(1.26E-04)
1050	(3.01E-04)		(1.13E-04)	(1.26E-04)
1080	(3.00E-04)		(1.13E-04)	(1.26E-04)
1110	(2.99E-04)		(1.12E-04)	(1.25E-04)
1140	(2.98E-04)		(1.12E-04)	(1.25E-04)
1170	(2.98E-04)		(1.12E-04)	(1.24E-04)
1200	(2.97E-04)		(1.11E-04)	(1.24E-04)
FIRST DATA ALT	300	300	150	150
LAST DATA ALT	930	900	930	930

FLIGHT NO. C-443
EQUIVALENT ATTENUATION LENGTH

(JOB 6561 DATE 03/29/79)
DATE 30978 FLIGHT NO. C-443 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(2.02E 03)	(3.07E 03)	(3.27E 03)	(3.33E 03)
300	2.05E 03	3.12E 03	3.35E 03	3.39E 03
600	2.13E 03	3.15E 03	3.86E 03	3.40E 03
900	2.35E 03	3.49E 03	4.65E 03	3.58E 03
1200	(2.54E 03)		(5.28E 03)	(4.14E 03)

FLIGHT NO. C-443
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	8.64E-01	9.08E-01	9.14E-01	9.15E-01
600	7.54E-01	8.27E-01	8.56E-01	8.38E-01
900	6.62E-01	7.73E-01	8.24E-01	7.78E-01
1200	(6.23E-01)		(7.97E-01)	(7.48E-01)

FLIGHT C-444 - 11 MARCH 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	1259	1411	1.20	55.3	-	59.6	2190	60
4,5	1415	1521	1.10	60.0	-	66.9	2460	60

Flight Description. Flight C-444 was an afternoon flight with take off at 1203 and landing at 1630 GMT. There were multiple cloud layers with the overcast cirrus at the highest level. The approximate east to west Yeovilton track was located between Bournemouth Hurn and Yeovilton near the south central coast of England. Typical terrain features were rolling green fields and woods interspersed with occasional brown fields and small towns.

In-Flight Notes. The in-flight observer reported that an approaching weak frontal system over Eire was pumping substantial cirrus into southern England area and that there were some areas of altocumulus clouds. There was dense low level haze with tops at 610 meters (2000 feet). Scattered to broken stratocumulus clouds were at 610 meters (2000 feet), scattered variable broken altostratus at 2700 meters (9000 feet) and overcast cirrus at 7600 meters (25,000 feet). Slant range visibility ranged from 3.2-13 kilometers (2 to 8 miles). The cirrus deck over the western half of the track was heavier than over the eastern half. The stratocumulus layer moving in from the west forced the track to be moved 8 kilometers (5 miles) to the east.

Local Weather Notes. Boscombe Down, 55 kilometers northeast of the track center, observed 5/8 stratus at 150 meters (500 feet) at 1200 GMT. These clouds dissipated and there were 2/8 to 4/8 cumulus at 450 to 750 meters (1500 to 2500 feet), 3/8 to 5/8 altocumulus at 2700 meters (9000 feet) and 6/8 to 7/8 cirrus and cirrostratus at 6600-7500 meters (22,000 to 25,000 feet). Visibility of 3.5 kilometers gradually improved to 7 kilometers in haze.

Yeovilton, 15 kilometers northwest of the track center, reported 1/8 stratocumulus at 1500 meters (5000 feet) gradually increasing to 5/8 and lowering to 1050 meters (3500 feet); 2/8 to 3/8 altocumulus at 3000 meters (10,000 feet); and 6/8 to 7/8 cirrus at 7500 meters (25,000 feet). Visibility was 4 kilometers in haze.

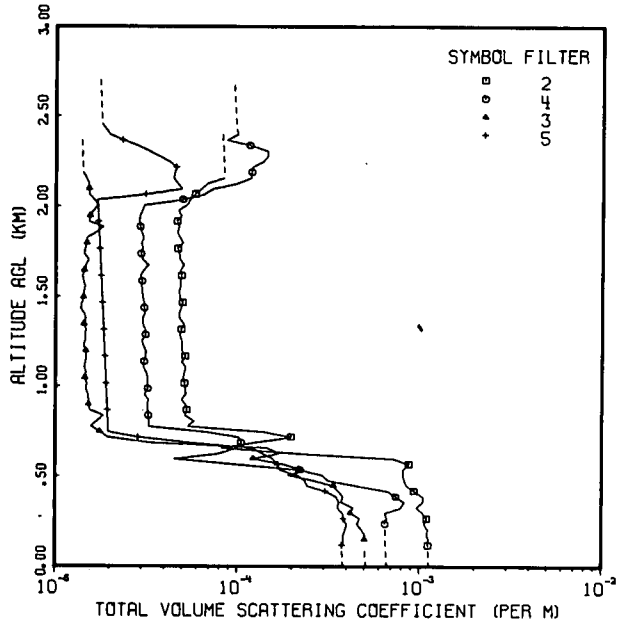
Bournemouth Hurn, 46 kilometers eastsoutheast of the flight track center, observed 1/8 to 2/8 altocumulus at 3000 meters (10,000 feet) gradually increasing to 5/8 and lowering to 1800 meters (6000 feet) by 1600 GMT. There was a 6/8 to 7/8 layer of cirrus and cirrostratus at 7500 meters (25,000 feet). Visibility was 4.0 to 4.7 kilometers in haze.

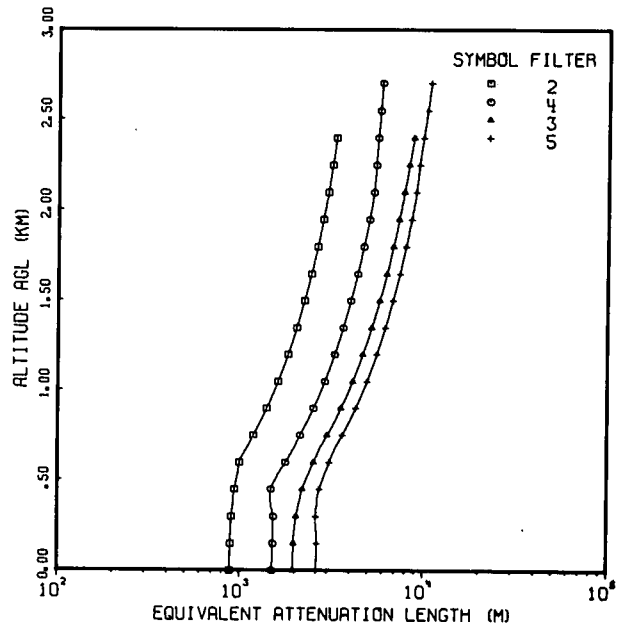
The radiosonde station at Crawley was 157 kilometers east and in an airflow parallel to the track. There was no appropriate vertical cross section.

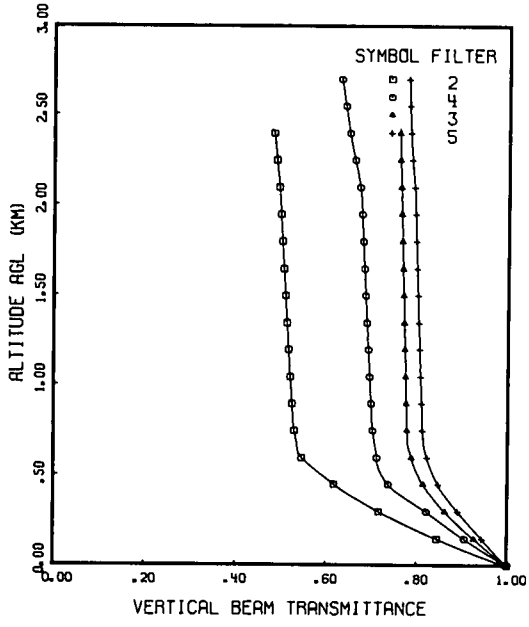
Synoptic Remarks. The surface chart had a low centered near Reykjavik with an occlusion eastsoutheastward and a warm front southeast through the Orkney Islands into the North Sea, then as a cold front eastward into Russia. A cold front also extended from the occlusion southward through the Irish Sea and Scilly Islands into Portugal. The flight path was in the warm sector of the storm with southerly flow and stable conditions. At 500 millibars there was ridging from northern Spain to the North Sea. The flow was southwesterly at this level. The air mass was stable maritime polar.

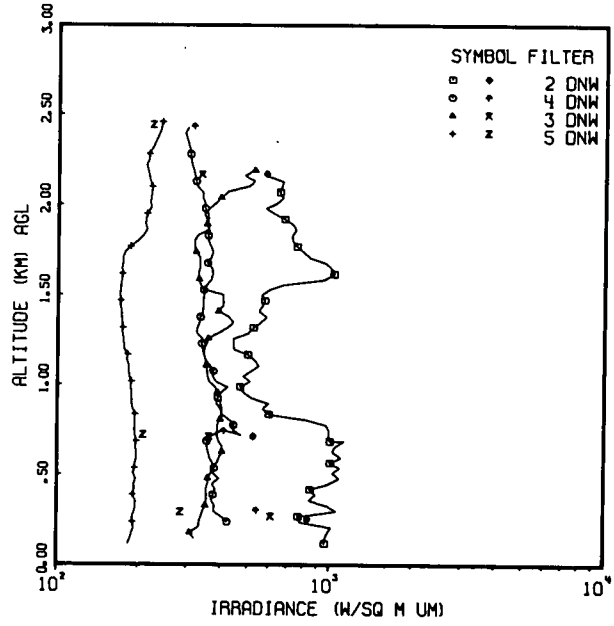
FLIGHT NO. C-444

YEOVILTON









FLIGHT NO. C-444
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6565 DATE 03/29/79)
DATE 31178 FLIGHT NO. C-444 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(1.13E-03)	(6.64E-04)	(5.11E-04)	(3.82E-04)
30	(1.13E-03)	(6.61E-04)	(5.08E-04)	(3.80E-04)
60	(1.12E-03)	(6.59E-04)	(5.07E-04)	(3.79E-04)
90	(1.12E-03)	(6.57E-04)	(5.06E-04)	(3.78E-04)
120	1.12E-03	(6.56E-04)	(5.05E-04)	3.77E-04
150	1.13E-03	(6.54E-04)	5.03E-04	3.85E-04
180	1.10E-03	(6.52E-04)	5.03E-04	3.83E-04
210	1.12E-03	(6.51E-04)	4.82E-04	3.93E-04
240	1.06E-03	6.49E-04	4.56E-04	4.01E-04
270	1.10E-03	6.63E-04	4.72E-04	3.84E-04
300	1.05E-03	6.50E-04	4.19E-04	3.80E-04
330	9.65E-04	7.92E-04	4.34E-04	3.56E-04
360	1.05E-03	8.29E-04	3.72E-04	3.63E-04
390	1.05E-03	7.41E-04	3.83E-04	3.49E-04
420	9.34E-04	6.71E-04	3.60E-04	3.05E-04
450	8.51E-04	4.55E-04	3.38E-04	2.42E-04
480	8.28E-04	3.14E-04	2.61E-04	2.35E-04
510	8.10E-04	2.93E-04	1.90E-04	2.13E-04
540	8.10E-04	2.20E-04	2.33E-04	1.71E-04
570	8.74E-04	9.72E-05	1.79E-04	1.66E-04
600	7.20E-04	4.51E-05	1.22E-04	1.56E-04
630	2.01E-04	7.95E-05	1.69E-04	1.37E-04
660	8.17E-05	9.90E-05	1.45E-04	1.19E-04
690	1.24E-04	1.05E-04	3.32E-05	5.40E-05
720	1.97E-04	1.02E-04	1.94E-05	2.85E-05
750	1.39E-04	6.74E-05	1.76E-05	1.96E-05
780	5.35E-05	5.27E-05	1.57E-05	1.95E-05
810	5.80E-05	5.27E-05	1.70E-05	1.94E-05
840	5.16E-05	5.26E-05	1.84E-05	1.94E-05
870	5.23E-05	5.22E-05	1.54E-05	1.93E-05
900	5.20E-05	5.21E-05	1.53E-05	1.93E-05
930	4.94E-05	5.26E-05	1.52E-05	1.92E-05
960	5.20E-05	5.09E-05	1.51E-05	1.91E-05
990	5.18E-05	5.22E-05	1.47E-05	1.91E-05
1020	5.11E-05	5.21E-05	1.49E-05	1.90E-05
1050	5.04E-05	5.22E-05	1.45E-05	1.90E-05
1080	5.12E-05	5.16E-05	1.47E-05	1.89E-05
1110	5.20E-05	5.06E-05	1.44E-05	1.88E-05
1140	4.95E-05	5.07E-05	1.47E-05	1.88E-05
1170	5.15E-05	5.14E-05	1.48E-05	1.87E-05
1200	4.97E-05	5.15E-05	1.47E-05	1.86E-05
1230	4.97E-05	5.05E-05	1.43E-05	1.86E-05
1260	4.92E-05	2.98E-05	1.46E-05	1.85E-05
1290	4.82E-05	5.13E-05	1.45E-05	1.85E-05
1320	4.92E-05	5.12E-05	1.47E-05	1.84E-05
1350	5.10E-05	5.03E-05	1.43E-05	1.83E-05
1380	4.81E-05	5.01E-05	1.46E-05	1.83E-05
1410	4.78E-05	5.10E-05	1.44E-05	1.82E-05
1440	4.90E-05	5.07E-05	1.37E-05	1.82E-05
1470	4.98E-05	5.07E-05	1.40E-05	1.81E-05
1500	4.81E-05	5.02E-05	1.42E-05	1.80E-05

FLIGHT NO. C-444
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6565 DATE 03/29/79)
DATE 31178 FLIGHT NO. C-444 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	4.77E-05	3.00E-05	1.43E-05	1.80E-05
1560	4.84E-05	2.97E-05	1.45E-05	1.79E-05
1590	4.85E-05	2.99E-05	1.42E-05	1.78E-05
1620	4.91E-05	2.92E-05	1.40E-05	1.78E-05
1650	4.84E-05	3.03E-05	1.44E-05	1.77E-05
1680	5.08E-05	3.23E-05	1.46E-05	1.77E-05
1710	4.81E-05	2.99E-05	1.52E-05	1.76E-05
1740	4.77E-05	2.94E-05	1.44E-05	1.75E-05
1770	4.67E-05	3.01E-05	1.45E-05	1.75E-05
1800	4.99E-05	2.96E-05	1.48E-05	1.74E-05
1830	4.81E-05	3.04E-05	1.48E-05	1.74E-05
1860	4.64E-05	2.97E-05	1.67E-05	1.73E-05
1890	4.75E-05	2.91E-05	1.83E-05	1.72E-05
1920	4.63E-05	2.88E-05	1.52E-05	1.72E-05
1950	4.90E-05	2.90E-05	1.55E-05	1.71E-05
1980	4.78E-05	2.99E-05	1.61E-05	1.70E-05
2010	5.25E-05	3.07E-05	1.71E-05	1.70E-05
2040	5.45E-05	4.99E-05	1.63E-05	1.69E-05
2070	5.81E-05	6.53E-05	1.53E-05	3.12E-05
2100	6.31E-05	7.33E-05	1.52E-05	4.92E-05
2130	6.81E-05	9.92E-05	1.51E-05	4.65E-05
2160	8.37E-05	1.18E-04	1.47E-05	4.42E-05
2190	(8.34E-05)	1.18E-04	1.41E-05	4.50E-05
2220	(8.31E-05)	1.20E-04	(1.41E-05)	4.57E-05
2250	(8.29E-05)	1.36E-04	(1.40E-05)	4.18E-05
2280	(8.26E-05)	1.45E-04	(1.40E-05)	3.71E-05
2310	(8.24E-05)	1.44E-04	(1.39E-05)	3.24E-05
2340	(8.21E-05)	1.15E-04	(1.39E-05)	2.78E-05
2370	(8.19E-05)	8.62E-05	(1.38E-05)	2.32E-05
2400	(8.16E-05)	9.92E-05	(1.38E-05)	1.98E-05
2430		9.71E-05		1.89E-05
2460		(9.68E-05)		1.79E-05
2490		(9.65E-05)		(1.78E-05)
2520		(9.62E-05)		(1.78E-05)
2550		(9.59E-05)		(1.77E-05)
2580		(9.56E-05)		(1.77E-05)
2610		(9.53E-05)		(1.76E-05)
2640		(9.50E-05)		(1.76E-05)
2670		(9.47E-05)		(1.75E-05)
2700		(9.44E-05)		(1.75E-05)
FIRST DATA ALT	120	240	150	120
LAST DATA ALT	2160	2430	2190	2460

FLIGHT NO. C-444
EQUIVALENT ATTENUATION LENGTH

(JOB 6565 DATE 03/29/79)
DATE 31178 FLIGHT NO. C-444 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(8.83E 02)	(1.51E 03)	(1.96E 03)	(2.62E 03)
300	9.02E 02	1.52E 03	2.04E 03	2.60E 03
600	9.93E 02	1.77E 03	2.52E 03	3.07E 03
900	1.40E 03	2.51E 03	3.55E 03	4.27E 03
1200	1.82E 03	3.26E 03	4.65E 03	5.54E 03
1500	2.22E 03	3.98E 03	5.72E 03	6.75E 03
1800	2.61E 03	4.66E 03	6.75E 03	7.91E 03
2100	2.98E 03	5.29E 03	7.74E 03	8.99E 03
2400	(3.30E 03)	5.55E 03	(8.71E 03)	9.80E 03
2700		(5.86E 03)		(1.08E 04)

FLIGHT NO. C-444
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

$\tau_{R_1} = 0.0168$

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	7.17E-01	8.21E-01	8.63E-01	8.91E-01
600	5.47E-01	7.12E-01	7.88E-01	8.23E-01
900	5.25E-01	6.99E-01	7.76E-01	8.10E-01
1200	5.17E-01	6.92E-01	7.73E-01	8.05E-01
1500	5.09E-01	6.86E-01	7.69E-01	8.01E-01
1800	5.02E-01	6.80E-01	7.66E-01	7.97E-01
2100	4.94E-01	6.72E-01	7.62E-01	7.92E-01
2400	(4.83E-01)	6.49E-01	(7.59E-01)	7.83E-01
2700		(6.31E-01)		(7.79E-01)

FLIGHT C-445 - 13 MARCH 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2	1115	1134	0.32	55.3	-	55.0	4560	6
3	1136	1153	0.28	54.9	54.9	54.9	4620	6
4	1152	1206	0.23	54.9	-	55.0	1200	6
5	1207	1215	0.13	55.0	-	55.2	1200	6

Flight Description. Flight C-445 was a midday flight spanning local apparent noon with take off at 1003 and landing at 1327 GMT. There were multiple cloud layers resulting in an overcast and rain. The approximate east to west Soesterberg track was located between Deelen and DeBilt in central Netherlands. Typical terrain features were brown and green fields interspersed with occasional small towns.

In-Flight Notes. The in-flight observer noted that there was 3/8 stratocumulus at 1200 meters (4000 feet) and 1/8 altostratus at 2400 meters (8000 feet) with cloud tops at 3700 meters (12,000 feet) and 1120 GMT. Conditions deteriorated to 1200 meters (4000 feet) broken clouds 1800 meters (6000 feet) overcast with light rain at 1200 GMT. Ahead of a line of showers it was relatively clear with light haze. Limited V-PRO's were taken below the cloud base. As the layered clouds moved into the area rapidly dual 2+2 was not possible due initially to a non-uniform sky and later to showers.

Local Weather Notes. DeBilt, 32 kilometers northwest of the track center, reported 1/8 cumulus at 750 meters (2500 feet), 1/8 altocumulus at 3000 meters (10,000 feet), 2/8 cirrus at 6000 meters (20,000 feet) with visibility 12 kilometers at 1000 GMT. The cloud decks increased to 5/8 cumulus at 810 meters (2700 feet), 6/8 altocumulus at 3000 meters (10,000 feet) and 7/8 cirrus at 6000 meters (20,000 feet) by 1100 GMT. Light rain showers began about 1200 GMT with the cumulus building to cumulonimbus with bases at 810 meters (2700 feet) and 6/8 coverage. The altocumulus increased to 7/8 in amount. At 1300 GMT the ceiling was 600 meters (2000 feet) with overcast cumulus and stratocumulus and rain reducing the visibility to 4.7 kilometers.

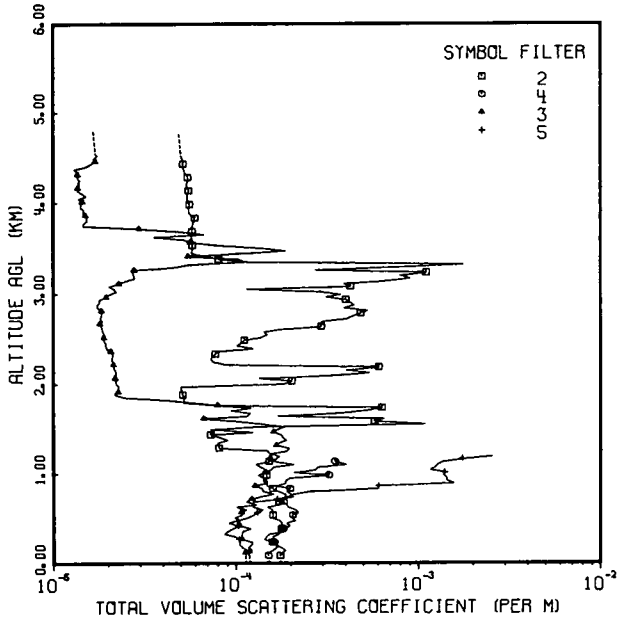
Soesterberg, 30 kilometers northwest of the track center, observed 1/8 cumulus at 900 meters (3000 feet), 1/8 thin altocumulus at 3600 meters (12,000 feet), 1/8 thin cirrus at 6000 meters (20,000 feet) and visibility 14 kilometers in haze at 1000 GMT. By 1100 GMT ceilings were 960 meters (3200 feet) with 7/8 cumulus and stratocumulus. Conditions deteriorated with ceilings lowering to 810 meters (2700 feet) by 1120 GMT with light rain showers and to 600 meters (2000 feet) by 1300 GMT. Rain showers continued with visibility 8 to 10 kilometers.

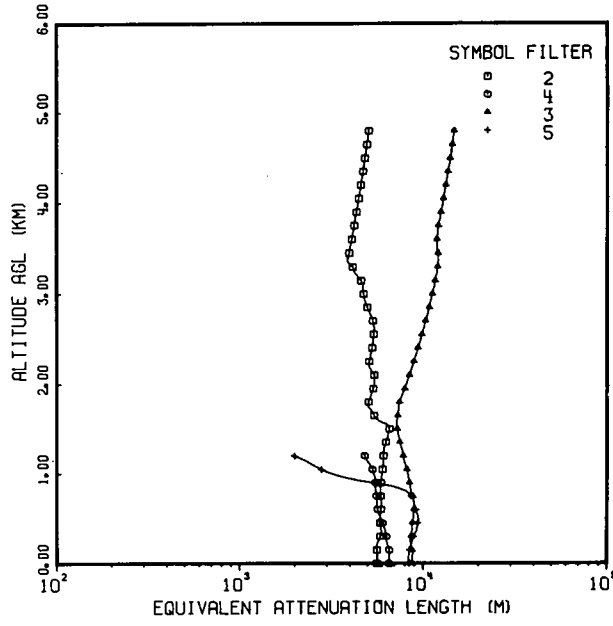
Deelen, 26 kilometers northeast of the track center, reported 2/8 to 3/8 cumulus at 450 to 750 meters (1500 to 2500 feet) and visibility 12 kilometers. At 1200 GMT there was 6/8 cumulonimbus at 810 meters (2700 feet) and 7/8 cirrus at 6000 meters (20,000 feet) with 18.0 kilometers visibility. Light rain showers commenced at 1300 GMT with cumulonimbus overcast at 1440 meters (4800 feet) and visibility 10 kilometers.

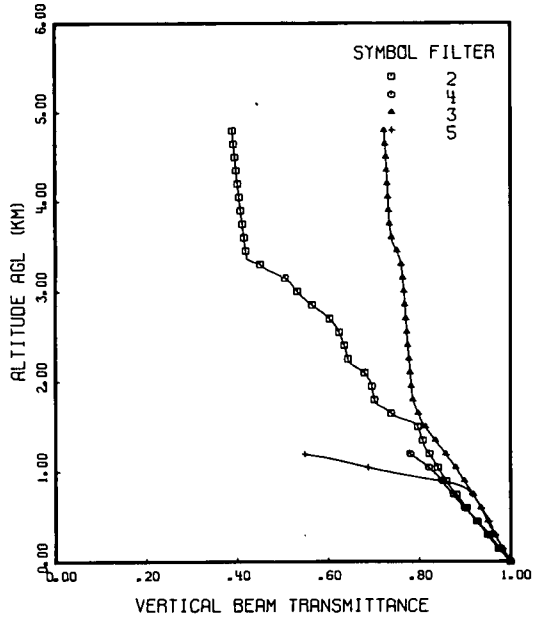
The radiosonde station at DeBilt was northwest and in an airflow parallel to the track. There was no appropriate vertical cross section.

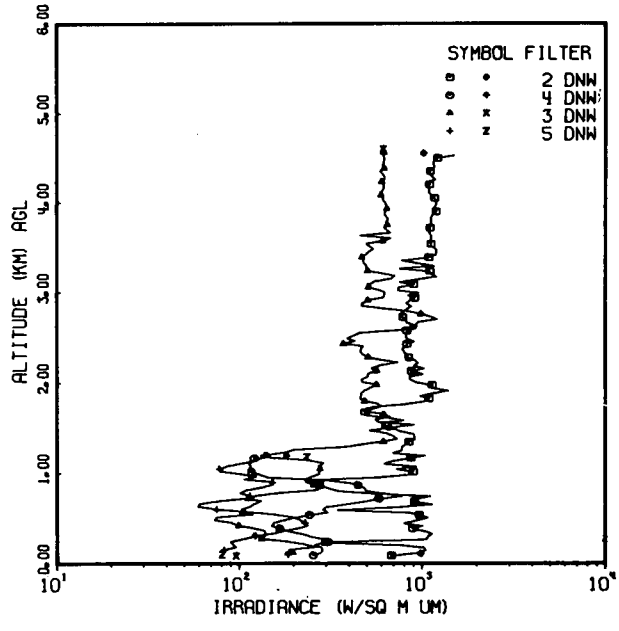
Synoptic Remarks. The surface chart had a cold front extending from a low in northern Sweden through western Poland into central Italy and Algeria. The ridge over Britain was weakening as another strong frontal system approached the Irish coast. The flight track had post cold frontal unstable conditions. At 500 millibars there was a trough from Norway southward through the Netherlands and France into Algeria. The flow at this level was westerly and the air mass was unstable maritime polar.

FLIGHT NO. C-445
SOESTERBERG









FLIGHT NO. C-445
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6578 DATE 03/29/79)
DATE 31378 FLIGHT NO. C-445 GROUND LEVEL ALTITUDE (M)= 6

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(1.77E-04)	(1.53E-04)	(1.14E-04)	(1.20E-04)
30	(1.76E-04)	(1.52E-04)	(1.14E-04)	(1.19E-04)
60	(1.76E-04)	(1.51E-04)	(1.14E-04)	(1.19E-04)
90	1.76E-04	1.51E-04	(1.13E-04)	(1.19E-04)
120	1.80E-04	1.50E-04	1.13E-04	1.18E-04
150	1.87E-04	1.60E-04	1.23E-04	1.15E-04
180	1.77E-04	1.67E-04	1.17E-04	1.08E-04
210	1.66E-04	1.67E-04	1.23E-04	1.05E-04
240	1.58E-04	1.62E-04	1.23E-04	1.05E-04
270	1.43E-04	1.64E-04	1.08E-04	1.04E-04
300	1.47E-04	1.59E-04	1.08E-04	9.95E-05
330	1.52E-04	1.72E-04	1.08E-04	8.64E-05
360	1.84E-04	1.73E-04	1.10E-04	9.10E-05
390	1.79E-04	1.82E-04	1.21E-04	9.67E-05
420	1.86E-04	1.98E-04	1.05E-04	1.03E-04
450	1.79E-04	1.91E-04	1.02E-04	9.14E-05
480	1.76E-04	2.12E-04	1.06E-04	1.02E-04
510	1.57E-04	2.03E-04	9.88E-05	1.17E-04
540	1.60E-04	2.06E-04	1.08E-04	1.26E-04
570	1.68E-04	2.20E-04	1.08E-04	1.32E-04
600	1.59E-04	2.13E-04	1.14E-04	1.41E-04
630	1.50E-04	1.95E-04	1.02E-04	1.25E-04
660	1.74E-04	1.89E-04	1.29E-04	1.26E-04
690	1.73E-04	1.83E-04	1.15E-04	1.25E-04
720	1.79E-04	1.66E-04	1.23E-04	1.69E-04
750	1.87E-04	2.07E-04	1.38E-04	1.95E-04
780	1.87E-04	2.01E-04	1.62E-04	2.09E-04
810	1.71E-04	1.90E-04	1.41E-04	2.57E-04
840	1.60E-04	1.99E-04	1.40E-04	6.08E-04
870	1.49E-04	1.68E-04	1.28E-04	6.09E-04
900	1.48E-04	1.87E-04	1.48E-04	1.57E-03
930	1.42E-04	1.80E-04	1.48E-04	1.44E-03
960	1.47E-04	1.99E-04	1.41E-04	1.44E-03
990	1.48E-04	3.25E-04	1.33E-04	1.38E-03
1020	1.49E-04	2.09E-04	1.45E-04	1.40E-03
1050	1.47E-04	2.75E-04	1.57E-04	1.16E-03
1080	1.37E-04	2.84E-04	1.62E-04	1.25E-03
1110	1.29E-04	4.04E-04	2.09E-04	1.28E-03
1140	1.52E-04	3.51E-04	1.65E-04	1.37E-03
1170	1.68E-04	3.57E-04	1.56E-04	1.75E-03
1200	1.73E-04	(3.56E-04)	1.53E-04	2.55E-03
1230	1.53E-04		1.60E-04	
1260	1.50E-04		1.92E-04	
1290	8.10E-05		1.97E-04	
1320	8.05E-05		1.68E-04	
1350	8.08E-05		1.74E-04	
1380	9.09E-05		1.90E-04	
1410	8.28E-05		1.82E-04	
1440	7.31E-05		1.78E-04	
1470	1.25E-04		1.62E-04	
1500	7.29E-05		1.71E-04	

FLIGHT NO. C-445
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6578 DATE 03/29/79)
DATE 31378 FLIGHT NO. C-445 GROUND LEVEL ALTITUDE (M)= 6

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	1.26E-04		1.86E-04	
1560	1.10E-04		1.39E-04	
1590	5.77E-04		1.03E-04	
1620	6.52E-04		6.70E-05	
1650	1.70E-04		1.17E-04	
1680	3.55E-04		1.21E-04	
1710	5.11E-04		9.47E-05	
1740	6.34E-04		1.21E-04	
1770	7.95E-05		7.99E-05	
1800	5.20E-05		5.73E-05	
1830	5.21E-05		4.15E-05	
1860	5.26E-05		2.43E-05	
1890	5.13E-05		2.18E-05	
1920	5.09E-05		2.28E-05	
1950	5.06E-05		2.28E-05	
1980	5.03E-05		2.29E-05	
2010	1.85E-04		2.22E-05	
2040	2.03E-04		2.21E-05	
2070	1.35E-04		2.19E-05	
2100	3.34E-04		2.17E-05	
2130	5.42E-04		2.23E-05	
2160	4.03E-04		2.19E-05	
2190	6.10E-04		2.15E-05	
2220	8.87E-05		2.15E-05	
2250	7.53E-05		2.13E-05	
2280	7.30E-05		2.10E-05	
2310	7.43E-05		2.12E-05	
2340	7.75E-05		2.13E-05	
2370	8.19E-05		2.08E-05	
2400	1.25E-04		1.97E-05	
2430	1.02E-04		1.95E-05	
2460	1.09E-04		1.94E-05	
2490	1.12E-04		1.90E-05	
2520	1.37E-04		1.90E-05	
2550	1.49E-04		1.90E-05	
2580	1.44E-04		1.89E-05	
2610	1.73E-04		1.86E-05	
2640	2.95E-04		1.84E-05	
2670	2.91E-04		1.80E-05	
2700	3.02E-04		1.87E-05	
2730	4.12E-04		1.82E-05	
2760	4.42E-04		1.83E-05	
2790	4.85E-04		1.85E-05	
2820	5.29E-04		1.84E-05	
2850	3.93E-04		1.76E-05	
2880	4.47E-04		1.74E-05	
2910	4.24E-04		1.79E-05	
2940	4.01E-04		1.79E-05	
2970	3.13E-04		1.96E-05	
3000	3.76E-04		2.04E-05	

FLIGHT NO. C-445
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6578 DATE 03/29/79)
DATE 31378 FLIGHT NO. C-445 GROUND LEVEL ALTITUDE (M)=

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	2.89E-04		2.22E-05	
3060	1.15E-04		2.17E-05	
3090	4.27E-04		2.03E-05	
3120	3.94E-04		2.30E-05	
3150	6.65E-04		2.49E-05	
3180	9.03E-04		2.81E-05	
3210	7.96E-04		2.77E-05	
3240	1.11E-03		2.74E-05	
3270	2.74E-04		2.79E-05	
3300	7.40E-04		4.55E-05	
3330	1.77E-03		5.57E-05	
3360	1.10E-04		1.13E-04	
3390	8.07E-05		1.03E-04	
3420	6.76E-05		5.51E-05	
3450	5.78E-05		1.02E-04	
3480	5.78E-05		1.89E-04	
3510	5.82E-05		1.34E-04	
3540	5.60E-05		7.86E-05	
3570	5.87E-05		5.68E-05	
3600	5.82E-05		5.20E-05	
3630	5.73E-05		3.59E-05	
3660	5.79E-05		6.73E-05	
3690	5.78E-05		4.85E-05	
3720	5.77E-05		2.97E-05	
3750	5.82E-05		1.46E-05	
3780	5.87E-05		1.48E-05	
3810	5.93E-05		1.54E-05	
3840	6.00E-05		1.52E-05	
3870	5.72E-05		1.51E-05	
3900	5.57E-05		1.46E-05	
3930	5.57E-05		1.48E-05	
3960	5.58E-05		1.42E-05	
3990	5.61E-05		1.42E-05	
4020	5.49E-05		1.45E-05	
4050	5.48E-05		1.38E-05	
4080	5.48E-05		1.52E-05	
4110	5.50E-05		1.44E-05	
4140	5.54E-05		1.37E-05	
4170	5.48E-05		1.37E-05	
4200	5.42E-05		1.40E-05	
4230	5.45E-05		1.38E-05	
4260	5.53E-05		1.40E-05	
4290	5.48E-05		1.37E-05	
4320	5.44E-05		1.36E-05	
4350	5.27E-05		1.35E-05	
4380	5.22E-05		1.31E-05	
4410	5.16E-05		1.52E-05	
4440	5.17E-05		1.61E-05	
4470	5.14E-05		1.71E-05	
4500	5.12E-05		1.67E-05	

FLIGHT NO. C-445
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6578 DATE 03/29/79)
DATE 31378 FLIGHT NO. C-445 GROUND LEVEL ALTITUDE (M)= 6

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
4530	5.05E-05		1.75E-05	
4560	(5.03E-05)		1.71E-05	
4590	(5.01E-05)		(1.70E-05)	
4620	(5.00E-05)		(1.70E-05)	
4650	(4.98E-05)		(1.69E-05)	
4680	(4.97E-05)		(1.69E-05)	
4710	(4.95E-05)		(1.68E-05)	
4740	(4.94E-05)		(1.68E-05)	
4770	(4.92E-05)		(1.67E-05)	
4800	(4.91E-05)		(1.67E-05)	
FIRST DATA ALT	90	90	120	120
LAST DATA ALT	4530	1170	4560	1200

FLIGHT NO. C-445
EQUIVALENT ATTENUATION LENGTH

(JOB 6578 DATE 03/29/79)
DATE 31378 FLIGHT NO. C-445 GROUND LEVEL ALTITUDE (M)= 6

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(5.64E 03)	(6.55E 03)	(8.74E 03)	(8.34E 03)
300	5.87E 03	6.32E 03	8.63E 03	8.90E 03
600	5.92E 03	5.67E 03	8.94E 03	9.14E 03
900	5.92E 03	5.53E 03	8.46E 03	5.49E 03
1200	6.11E 03	(4.83E 03)	7.82E 03	2.00E 03
1500	6.60E 03		7.27E 03	
1800	5.07E 03		7.40E 03	
2100	5.44E 03		8.45E 03	
2400	5.29E 03		9.42E 03	
2700	5.34E 03		1.04E 04	
3000	4.75E 03		1.13E 04	
3300	4.14E 03		1.21E 04	
3600	4.10E 03		1.19E 04	
3900	4.35E 03		1.26E 04	
4200	4.60E 03		1.33E 04	
4500	4.85E 03		1.41E 04	
4800	(5.09E 03)		(1.48E 04)	

FLIGHT NO. C-445
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.50E-01	9.54E-01	9.66E-01	9.67E-01
600	9.04E-01	9.00E-01	9.35E-01	9.36E-01
900	8.59E-01	8.50E-01	8.99E-01	8.49E-01
1200	8.22E-01	(7.80E-01)	8.58E-01	5.49E-01
1500	7.97E-01		8.14E-01	
1800	7.01E-01		7.86E-01	
2100	6.80E-01		7.80E-01	
2400	6.35E-01		7.75E-01	
2700	6.03E-01		7.71E-01	
3000	5.32E-01		7.66E-01	
3300	4.51E-01		7.61E-01	
3600	4.15E-01		7.40E-01	
3900	4.08E-01		7.33E-01	
4200	4.02E-01		7.30E-01	
4500	3.95E-01		7.27E-01	
4800	(3.89E-01)		(7.23E-01)	

FLIGHT C-446 - 15 MARCH 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	1116	1158	0.70	54.8	-	53.3	870	60
4,5	1204	1238	0.57	53.2	53.1	53.3	810	60

Flight Description. Flight C-446 was a late morning flight spanning local apparent noon with take off at 1015 and data tape ending about 1240 GMT. There were multiple layers of clouds with overcast cirrus at the highest level. The approximate east to west Yeovilton track was located between Bournemouth Hurn and Yeovilton near the south central coast of England. Typical terrain features were rolling green fields and woods interspersed with occasional brown fields and small towns.

In-Flight Notes. The in-flight observer noted that there was a minor trough clearing the area with a second trough very close behind. Heavy cirrus was overhead but the low cumulus was clearing. More cumulus was visible to the west. Haze below the cloud bases was relatively uniform in strong surface winds. Haze top was slightly above the 1200 meters (4000 feet) cloud bases. There was scattered to broken stratocumulus at 1200 meters (4000 feet), overcast altocumulus at 3700 meters (12,000 feet) and overcast cirrus. Slant visibility was 14 kilometers (9 miles) with moderate haze.

Local Weather Notes. Boscombe Down, 55 kilometers northeast of the track center, reported 1/8 to 2/8 cumulus and stratocumulus at 750 meters (2500 feet) and 6/8 cirrus and cirrostratus at 6600 to 7500 meters (22,000 to 25,000 feet) with visibility 25 to 30 kilometers.

Yeovilton, 15 kilometers northwest of the track center, recorded 2/8 to 4/8 cumulus and stratocumulus at 600 to 750 meters (2000 to 2500 feet) throughout the period. There was 8/8 altostratus at 3600 meters (12,000 feet) reported only on the 1000 GMT observation. Overcast cirrostratus varied in height from 6000 to 7500 meters (20,000 to 25,000 feet). Visibility was 8 to 15 kilometers in haze.

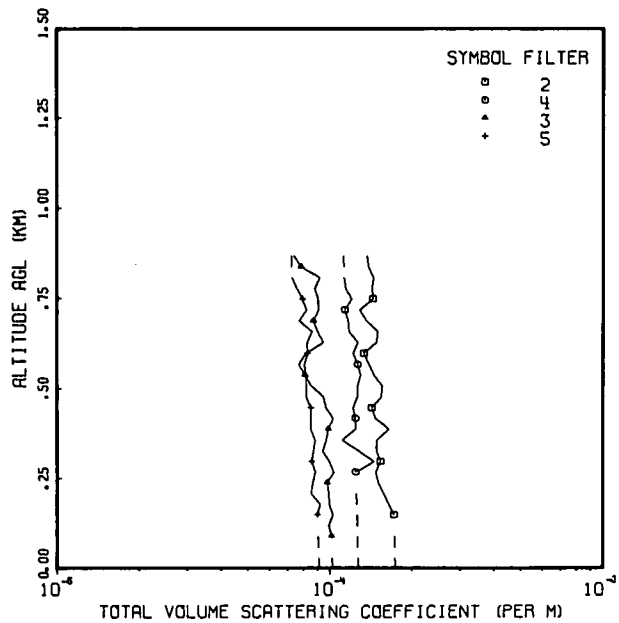
Bournemouth Hurn, 46 kilometers eastsoutheast of the flight track center, reported 1/8 to 2/8 cumulus and stratocumulus at 750 meters (2500 feet), 3/8 altostratus at 3600 meters (12,000 feet) and 5/8 thin cirrus at 6000 meters (20,000 feet) increasing to 8/8 cirrostratus at the same level. Visibility was 11.2 to 15 kilometers.

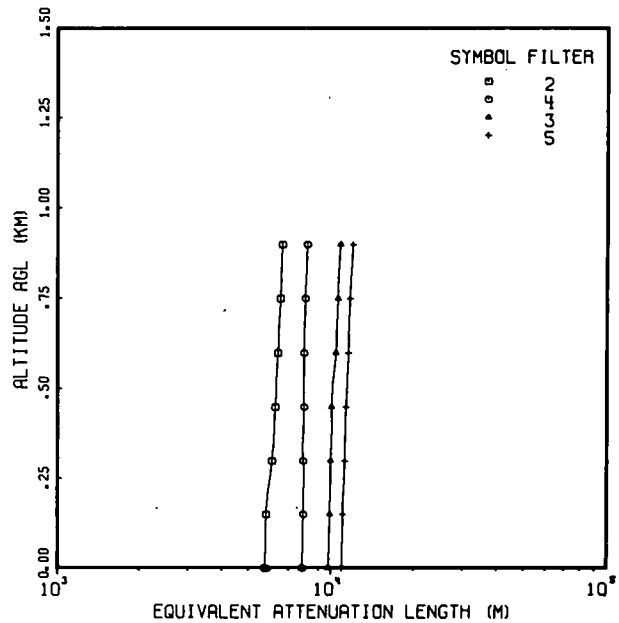
The radiosonde station at Crawley was 157 kilometers east and in an airflow parallel to the track. The vertical cross section for 1200 GMT showed 5/8 cloud from 500 to 1200 meters and clear above.

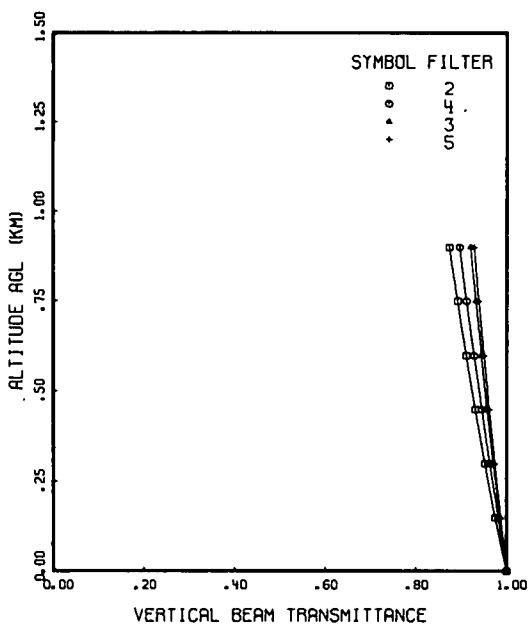
Synoptic Remarks. The surface chart had an occluded front that extended from south of Iceland to central Ireland then as a cold front southwest and west to another low in the western Atlantic. There was strong west-southwesterly flow at the surface over southern England in advance of the occlusion. At 500 millibars there was slight ridging from Spain through western France and England with westerly flow. The air mass was stable maritime polar.

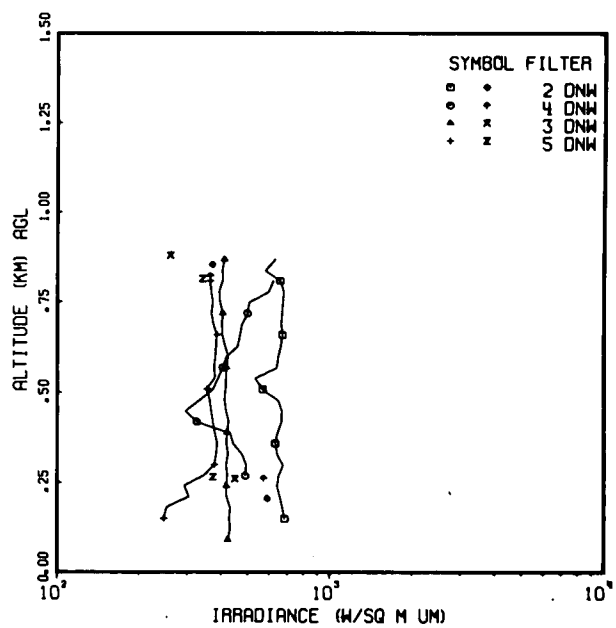
FLIGHT NO. C-446

YEOVILTON









FLIGHT NO. C-446
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6588 DATE 03/29/79)
DATE 31578 FLIGHT NO. C-446 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(1.74E-04)	(1.27E-04)	(1.02E-04)	(9.14E-05)
30	(1.73E-04)	(1.27E-04)	(1.02E-04)	(9.09E-05)
60	(1.73E-04)	(1.26E-04)	(1.02E-04)	(9.07E-05)
90	(1.72E-04)	(1.26E-04)	1.01E-04	(9.05E-05)
120	(1.72E-04)	(1.26E-04)	9.88E-05	(9.03E-05)
150	1.71E-04	(1.26E-04)	1.02E-04	9.00E-05
180	1.64E-04	(1.25E-04)	9.94E-05	9.20E-05
210	1.57E-04	(1.25E-04)	9.90E-05	8.55E-05
240	1.50E-04	(1.25E-04)	9.78E-05	8.64E-05
270	1.47E-04	1.24E-04	1.03E-04	8.84E-05
300	1.53E-04	1.45E-04	9.94E-05	8.58E-05
330	1.48E-04	1.28E-04	9.40E-05	8.71E-05
360	1.49E-04	1.11E-04	9.69E-05	8.83E-05
390	1.65E-04	1.24E-04	9.86E-05	8.51E-05
420	1.47E-04	1.24E-04	1.03E-04	8.51E-05
450	1.42E-04	1.22E-04	9.69E-05	8.51E-05
480	1.54E-04	1.26E-04	9.46E-05	8.18E-05
510	1.56E-04	1.26E-04	8.53E-05	8.16E-05
540	1.45E-04	1.30E-04	8.10E-05	8.12E-05
570	1.39E-04	1.26E-04	7.68E-05	8.05E-05
600	1.33E-04	1.22E-04	8.13E-05	8.27E-05
630	1.48E-04	1.27E-04	9.44E-05	8.24E-05
660	1.50E-04	1.17E-04	8.99E-05	8.60E-05
690	1.36E-04	1.17E-04	8.70E-05	7.70E-05
720	1.29E-04	1.13E-04	9.07E-05	8.19E-05
750	1.44E-04	1.20E-04	9.04E-05	7.93E-05
780	1.43E-04	1.14E-04	8.78E-05	7.56E-05
810	1.44E-04	1.13E-04	9.17E-05	7.24E-05
840	1.38E-04	(1.12E-04)	7.82E-05	(7.22E-05)
870	1.37E-04	(1.12E-04)	7.38E-05	(7.20E-05)
900	(1.36E-04)	(1.12E-04)	(7.36E-05)	(7.18E-05)
FIRST DATA ALT	150	270	90	150
LAST DATA ALT	870	810	870	810

FLIGHT NO. C-446
EQUIVALENT ATTENUATION LENGTH

(JOB 6588 DATE 03/29/79)
DATE 31578 FLIGHT NO. C-446 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(5.75E 03)	(7.85E 03)	(9.78E 03)	(1.09E 04)
300	6.08E 03	7.90E 03	9.94E 03	1.12E 04
600	6.39E 03	7.95E 03	1.04E 04	1.15E 04
900	(6.62E 03)	(8.16E 03)	(1.08E 04)	(1.20E 04)

FLIGHT NO. C-446
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.52E-01	9.63E-01	9.70E-01	9.74E-01
600	9.10E-01	9.27E-01	9.44E-01	9.49E-01
900	(8.73E-01)	(8.96E-01)	(9.20E-01)	(9.27E-01)

FLIGHT C-447 - 15 MARCH 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2	1247	1303	0.27	53.4	-	53.9	3570	60
3	1305	1342	0.62	54.0	-	56.0	3510	60
4	1344	1401	0.28	56.1	-	57.4	3510	60
5	1402	1415	0.22	57.5	-	58.6	3510	60

Flight Description. Flight C-447 was an afternoon flight with data tape commencing about 1245 and landing at 1506 GMT. There were multiple layers of clouds with overcast altostratus. The approximate east to west Yeovilton track was located between Bournemouth Hurn and Yeovilton near the south central coast of England. Typical terrain features were rolling green fields and woods interspersed with occasional brown fields and small towns.

In-Flight Notes. The in-flight observer reported scattered cumulus at 1200 meters (4000 feet) and overcast altostratus at 3700 meters (12,000 feet) on the east end of the track. The haze was uniform to 760 meters (2500 feet). On the V-PRO very light precipitation was encountered but they were out of it at 910 meters (3000 feet). Cumulus bases were at 1000 meters (3300 feet) with possible cloud debris from 1000 to 1800 meters (3300 to 6000 feet). In light precipitation at 1700 meters (5600 feet) and out of it at 1800 meters (5800 feet). Haze tops were at 1000 meters (3300 feet) at the base of the clouds with light haze above. Cloud tops were 2200 meters (7300 feet). Altostratus bases were at 3700 meters (12,000 feet) with very indistinct base. At 1305 GMT start of the descent was in thin altostratus and out at 3400 meters (11,000 feet). Descent was aborted due to eastern migration of line of showers. At 1333 GMT in an open area with scattered clouds at 1200 meters (4000 feet), scattered layer at 2100 meters (7000 feet) and overcast at 3700 meters (12,000 feet). Haze remains similar, i.e., thin below 3700 meters (12,000 feet) but noticeably thicker below 1200 meters (4000 feet); cloud bases at 1100 meters (3500 feet), visibility 16 kilometers (10 miles). At 1405 GMT descent was in the clear.

Local Weather Notes. Boscombe Down, 55 kilometers northeast of the track center, observed 2/8 to 3/8 cumulus and stratocumulus at 900 to 1050 meters (3000 to 3500 feet), 8/8 cirrostratus at 6600 meters (22,000 feet) with visibility 25 kilometers.

Yeovilton, 15 kilometers northwest of the track center, reported 2/8 cumulus and stratocumulus at 900 meters (3000 feet), 4/8 to 5/8 altostratus at 3600 meters (12,000 feet), and overcast cirrostratus at 7500 meters (25,000 feet). Visibility was 8 to 12 kilometers in haze.

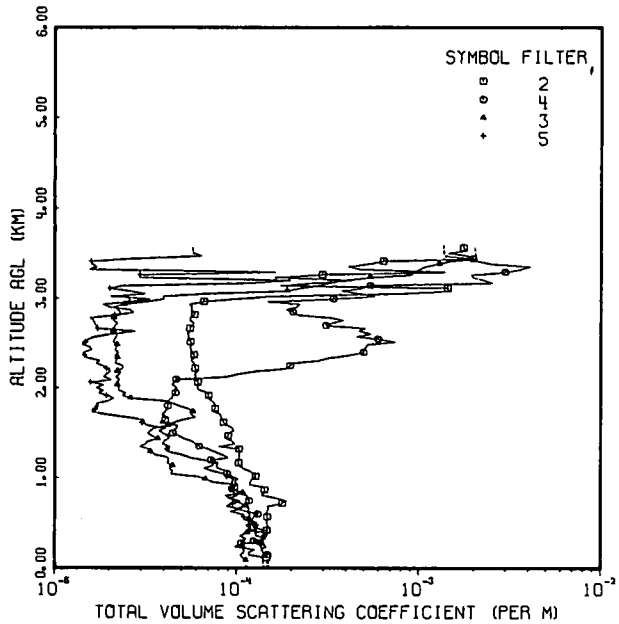
Bournemouth Hurn, 46 kilometers eastsoutheast of the track center, reported 1/8 to 2/8 cumulus and stratocumulus at 750 meters (2500 feet), 3/8 to 8/8 altostratus at 1080 to 1350 meters (3600 to 4500 feet). Visibility was observed as 11 to 15 kilometers.

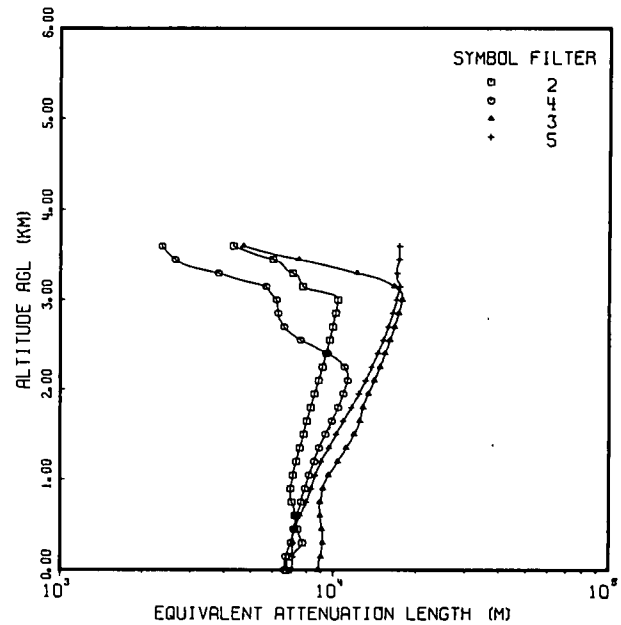
The radiosonde station at Crawley was 157 kilometers east and in an airflow parallel to the track. The vertical cross section for 1200 GMT showed 5/8 cloud from 500 to 1200 meters and clear above.

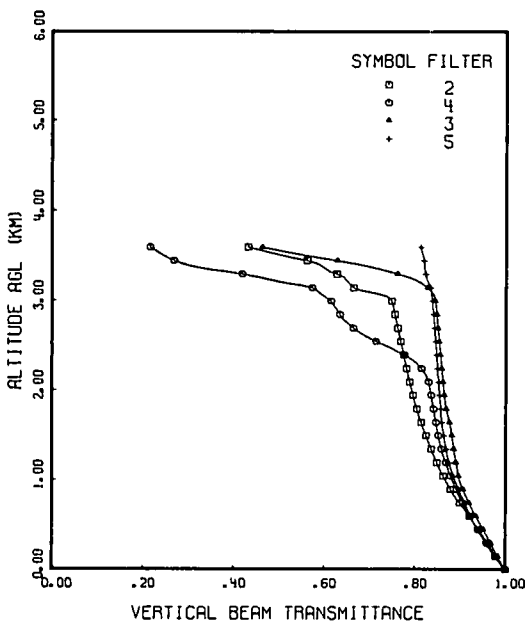
Synoptic Remarks. The surface chart had an occluded front that extended from south of Iceland to central Ireland then as a cold front southwest and west to another low in the western Atlantic. There was strong west-southwesterly flow at the surface over southern England in advance of the occlusion. At 500 millibars there was slight ridging from Spain through western France and England with westerly flow. The air mass was stable maritime polar.

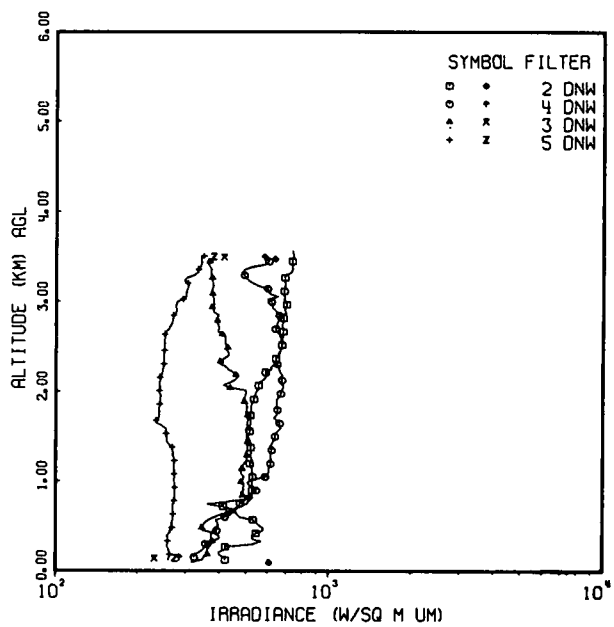
FLIGHT NO. C-447

YEOVILTON









FLIGHT NO. C-447
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6598 DATE 03/29/79)
DATE 31578 FLIGHT NO. C-447 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(1.49E-04)	(1.51E-04)	(1.14E-04)	(1.42E-04)
30	(1.48E-04)	(1.50E-04)	(1.13E-04)	(1.41E-04)
60	(1.48E-04)	(1.50E-04)	(1.13E-04)	(1.41E-04)
90	(1.47E-04)	(1.49E-04)	1.13E-04	(1.40E-04)
120	1.47E-04	(1.49E-04)	1.08E-04	1.40E-04
150	1.17E-04	1.48E-04	1.05E-04	1.45E-04
180	1.18E-04	1.40E-04	1.10E-04	1.40E-04
210	1.26E-04	1.37E-04	1.09E-04	1.36E-04
240	9.74E-05	1.38E-04	1.08E-04	1.46E-04
270	1.06E-04	1.31E-04	1.07E-04	1.38E-04
300	1.41E-04	1.24E-04	1.06E-04	1.34E-04
330	1.41E-04	1.45E-04	1.13E-04	1.43E-04
360	1.46E-04	1.28E-04	1.04E-04	1.38E-04
390	1.49E-04	1.27E-04	1.14E-04	1.47E-04
420	1.47E-04	1.45E-04	1.15E-04	1.18E-04
450	1.51E-04	1.24E-04	1.20E-04	1.18E-04
480	1.48E-04	1.32E-04	1.16E-04	1.13E-04
510	1.46E-04	1.20E-04	1.17E-04	1.30E-04
540	1.48E-04	1.23E-04	1.17E-04	1.11E-04
570	1.47E-04	1.24E-04	1.19E-04	1.10E-04
600	1.47E-04	1.31E-04	1.18E-04	1.08E-04
630	1.47E-04	1.13E-04	1.14E-04	9.17E-05
660	1.50E-04	9.99E-05	1.18E-04	1.07E-04
690	1.48E-04	1.09E-04	1.12E-04	8.79E-05
720	1.78E-04	1.17E-04	1.06E-04	9.49E-05
750	1.89E-04	1.17E-04	9.79E-05	1.04E-04
780	1.63E-04	1.14E-04	9.24E-05	9.00E-05
810	1.37E-04	1.15E-04	8.61E-05	1.01E-04
840	1.42E-04	9.65E-05	1.08E-04	9.64E-05
870	1.42E-04	9.66E-05	9.51E-05	9.27E-05
900	1.43E-04	9.72E-05	9.43E-05	9.00E-05
930	1.17E-04	1.02E-04	1.00E-04	9.72E-05
960	1.19E-04	9.67E-05	7.37E-05	9.35E-05
990	1.21E-04	1.02E-04	6.74E-05	9.68E-05
1020	1.28E-04	9.44E-05	6.11E-05	8.85E-05
1050	1.25E-04	8.87E-05	4.36E-05	8.54E-05
1080	1.18E-04	8.83E-05	4.46E-05	7.42E-05
1110	1.06E-04	7.86E-05	4.26E-05	6.58E-05
1140	1.03E-04	7.77E-05	4.45E-05	7.38E-05
1170	1.02E-04	7.90E-05	4.16E-05	7.39E-05
1200	1.02E-04	7.22E-05	4.23E-05	6.65E-05
1230	1.03E-04	8.95E-05	4.22E-05	5.49E-05
1260	1.04E-04	8.30E-05	3.56E-05	5.00E-05
1290	1.04E-04	7.59E-05	3.37E-05	4.22E-05
1320	1.03E-04	7.04E-05	3.35E-05	4.14E-05
1350	7.94E-05	6.23E-05	2.93E-05	4.31E-05
1380	9.73E-05	5.90E-05	3.14E-05	3.91E-05
1410	9.44E-05	5.69E-05	3.26E-05	4.02E-05
1440	8.82E-05	5.11E-05	3.70E-05	4.19E-05
1470	8.96E-05	4.82E-05	3.44E-05	4.26E-05
1500	9.09E-05	4.46E-05	3.25E-05	3.91E-05

FLIGHT NO. C-447
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6598 DATE 03/29/79)
DATE 31578 FLIGHT NO. C-447 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	9.61E-05	4.49E-05	3.37E-05	3.74E-05
1560	9.47E-05	4.66E-05	3.54E-05	4.08E-05
1590	8.85E-05	4.74E-05	4.20E-05	3.24E-05
1620	8.43E-05	3.78E-05	4.51E-05	3.02E-05
1650	8.31E-05	4.06E-05	5.01E-05	3.10E-05
1680	8.21E-05	4.18E-05	5.95E-05	2.50E-05
1710	8.11E-05	3.88E-05	5.60E-05	1.92E-05
1740	7.42E-05	4.07E-05	5.75E-05	1.59E-05
1770	7.60E-05	4.16E-05	5.46E-05	1.67E-05
1800	7.66E-05	4.18E-05	4.85E-05	1.74E-05
1830	7.53E-05	4.19E-05	4.47E-05	1.69E-05
1860	7.24E-05	4.19E-05	4.07E-05	1.97E-05
1890	6.94E-05	4.40E-05	2.62E-05	2.12E-05
1920	6.99E-05	4.44E-05	2.34E-05	1.94E-05
1950	6.95E-05	4.61E-05	2.46E-05	1.74E-05
1980	6.21E-05	4.55E-05	2.25E-05	1.85E-05
2010	6.05E-05	4.71E-05	2.25E-05	1.69E-05
2040	6.19E-05	4.43E-05	2.21E-05	1.87E-05
2070	6.10E-05	4.53E-05	2.22E-05	1.58E-05
2100	5.80E-05	4.65E-05	2.27E-05	2.04E-05
2130	5.98E-05	8.86E-05	2.16E-05	1.86E-05
2160	5.88E-05	1.02E-04	2.29E-05	1.94E-05
2190	6.05E-05	1.26E-04	2.22E-05	2.04E-05
2220	5.88E-05	1.88E-04	2.36E-05	1.93E-05
2250	5.91E-05	1.96E-04	2.37E-05	1.83E-05
2280	5.81E-05	2.05E-04	2.15E-05	1.69E-05
2310	5.61E-05	2.82E-04	2.19E-05	1.78E-05
2340	5.82E-05	3.24E-04	2.22E-05	1.49E-05
2370	5.80E-05	4.10E-04	2.15E-05	1.46E-05
2400	5.56E-05	4.97E-04	2.24E-05	1.43E-05
2430	5.63E-05	4.99E-04	2.13E-05	1.60E-05
2460	5.51E-05	5.11E-04	2.18E-05	1.57E-05
2490	5.70E-05	5.23E-04	2.21E-05	1.42E-05
2520	5.57E-05	7.42E-04	2.10E-05	1.47E-05
2550	5.42E-05	5.98E-04	2.14E-05	1.52E-05
2580	5.47E-05	4.53E-04	2.18E-05	1.67E-05
2610	5.37E-05	5.46E-04	2.21E-05	2.05E-05
2640	5.55E-05	4.68E-04	2.09E-05	2.78E-05
2670	5.53E-05	5.09E-04	2.13E-05	1.73E-05
2700	5.74E-05	3.08E-04	2.15E-05	1.69E-05
2730	5.81E-05	3.34E-04	2.22E-05	1.66E-05
2760	5.51E-05	3.84E-04	2.09E-05	1.63E-05
2790	5.56E-05	3.22E-04	2.11E-05	1.56E-05
2820	5.85E-05	2.16E-04	2.27E-05	2.14E-05
2850	5.78E-05	2.02E-04	2.29E-05	2.71E-05
2880	5.62E-05	1.86E-04	2.21E-05	2.58E-05
2910	5.71E-05	2.14E-04	2.13E-05	2.00E-05
2940	5.47E-05	2.20E-04	2.41E-05	1.84E-05
2970	6.59E-05	1.47E-04	3.17E-05	2.58E-05
3000	9.76E-05	3.39E-04	3.98E-05	3.33E-05

FLIGHT NO. C-447
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6598 DATE 03/29/79)
DATE 31578 FLIGHT NO. C-447 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	1.54E-04	5.70E-04	3.96E-05	2.04E-05
3060	7.82E-04	4.72E-04	6.65E-05	3.15E-05
3090	1.46E-03	3.76E-04	1.88E-04	2.59E-05
3120	1.44E-03	4.81E-04	2.23E-04	2.02E-05
3150	1.73E-04	5.41E-04	2.76E-04	2.36E-05
3180	2.63E-04	2.54E-03	3.30E-04	1.16E-04
3210	4.25E-04	2.26E-03	3.84E-04	1.96E-04
3240	1.61E-04	1.98E-03	5.39E-04	2.92E-05
3270	2.95E-04	1.95E-03	9.11E-04	2.94E-05
3300	1.38E-03	2.97E-03	9.39E-04	1.63E-04
3330	4.66E-04	3.63E-03	1.02E-03	1.55E-05
3360	4.08E-04	4.08E-03	1.09E-03	1.71E-05
3390	5.23E-04	2.49E-03	1.29E-03	1.61E-05
3420	6.37E-04	2.09E-03	1.49E-03	1.59E-05
3450	1.91E-03	1.98E-03	2.06E-03	2.66E-05
3480	1.87E-03	1.38E-03	(2.05E-03)	6.44E-05
3510	1.45E-03	(1.38E-03)	(2.05E-03)	5.75E-05
3540	1.82E-03	(1.38E-03)	(2.04E-03)	(5.73E-05)
3570	1.76E-03	(1.37E-03)	(2.03E-03)	(5.72E-05)
3600	(1.75E-03)	(1.37E-03)	(2.03E-03)	(5.70E-05)
FIRST DATA ALT	120	150	90	120
LAST DATA ALT	3570	3480	3450	3510

FLIGHT NO. C-447
EQUIVALENT ATTENUATION LENGTH

(JOB 6598 DATE 03/29/79)
DATE 31278 FLIGHT NO. C-447 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(6.73E 03)	(6.63E 03)	(8.80E 03)	(7.06E 03)
300	7.71E 03	7.00E 03	9.14E 03	7.12E 03
600	7.24E 03	7.34E 03	8.92E 03	7.54E 03
900	6.97E 03	7.86E 03	9.15E 03	8.29E 03
1200	7.32E 03	8.50E 03	1.03E 04	9.00E 03
1500	7.78E 03	9.33E 03	1.19E 04	1.02E 04
1800	8.25E 03	1.04E 04	1.28E 04	1.16E 04
2100	8.82E 03	1.12E 04	1.41E 04	1.31E 04
2400	9.38E 03	9.50E 03	1.54E 04	1.45E 04
2700	9.91E 03	6.58E 03	1.66E 04	1.58E 04
3000	1.03E 04	6.16E 03	1.77E 04	1.69E 04
3300	7.07E 03	3.79E 03	1.21E 04	1.69E 04
3600	(4.29E 03)	(2.35E 03)	(4.67E 03)	(1.73E 04)

FLIGHT NO. C-447
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.62E-01	9.58E-01	9.68E-01	9.59E-01
600	9.20E-01	9.22E-01	9.35E-01	9.23E-01
900	8.79E-01	8.92E-01	9.06E-01	8.97E-01
1200	8.49E-01	8.68E-01	8.91E-01	8.75E-01
1500	8.25E-01	8.51E-01	8.81E-01	8.63E-01
1800	8.04E-01	8.41E-01	8.69E-01	8.56E-01
2100	7.88E-01	8.30E-01	8.61E-01	8.52E-01
2400	7.74E-01	7.77E-01	8.56E-01	8.47E-01
2700	7.62E-01	6.63E-01	8.50E-01	8.43E-01
3000	7.48E-01	6.15E-01	8.44E-01	8.37E-01
3300	6.27E-01	4.18E-01	7.61E-01	8.23E-01
3600	(4.32E-01)	(2.17E-01)	(4.63E-01)	(8.12E-01)

FLIGHT C-448 - 17 MARCH 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2	1118	1146	0.47	53.9	-	52.8	5970	60
3	1147	1212	0.42	52.7	-	52.3	5970	60
4	1211	1238	0.45	52.3	52.3	52.5	6000	60
5	1240	1259	0.32	52.5	-	53.0	5970	60

Flight Description. Flight C-448 was a midday flight spanning local apparent noon with take off at 0958 and landing at 1452 GMT. There were multiple layers of broken clouds. The approximate east to west Yeovilton track was located between Bournemouth Hurn and Yeovilton near the south central coast of England. Typical terrain features were rolling green fields interspersed with occasional brown fields and small towns.

In-Flight Notes. The in-flight observer noted that extensive cloudiness was associated with a weak motion about a deep low to the east of Britain. On the first ascent there was cloud debris at 910 meters (3000 feet), at 790 meters (2600 feet) in cloud, on top at 1300 meters (4200 feet), tops were variable 1100 to 1500 meters (3500 to 5000 feet). From 1700 to 1800 meters (5700 to 5900 feet) there was a thin layer of altostratus. On the descent it was clear all the way down. At 1220 GMT there was cloud debris at 910 meters (3000 feet), scattered variable broken bases at 910 meters (3000 feet) with tops 1600 to 1900 meters (5200 to 6100 feet) and thin haze above. Cirrus bases were about 6100 meters (20,000 feet). On the last descent approached the cirrus bases at 6100 meters (20,000 feet), in clear to 2300 meters (7500 feet) where descent was through a hole. Altostratus tops were 2300 meters (7500 feet) and bases 1200 meters (4000 feet) with some ragged bases below. There was haze below the clouds.

Local Weather Notes. Boscombe Down, 55 kilometers northeast of the track center, reported 4/8 varying to 7/8 cumulus and stratocumulus based from 840 to 1200 meters (2800 to 4000 feet) and 6/8 to 7/8 cirrus at 6600 to 7500 meters (22,000 to 25,000 feet). Visibility was 20 to 30 kilometers. At 1500 GMT there were rain showers in the distance.

Yeovilton, 15 kilometers northwest of the track center, observed cumulus and stratocumulus in amounts varying from 7/8 to 3/8 with bases 600 to 840 meters (2000 to 2800 feet), and 5/8 to 6/8 thin cirrus at 6000 meters (20,000 feet). Visibility was 10 to 14 kilometers in haze.

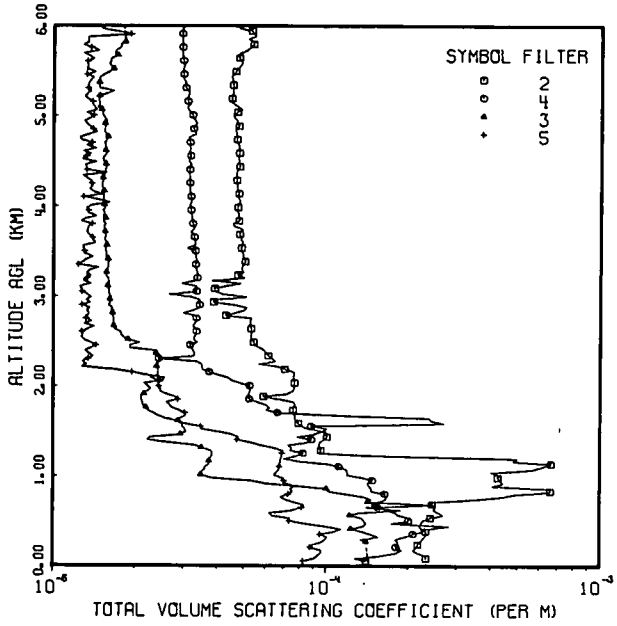
Bournemouth Hurn, 46 kilometers eastsoutheast of the track center, recorded 6/8 cumulus and stratocumulus at 450 to 540 meters (1500 to 1800 feet) before noon. These clouds decreased to 3/8 to 4/8 and the bases lifted to 540 to 600 meters (1800 to 2000 feet) after noon with 5/8 to 7/8 cirrus at 6000 to 7500 meters (20,000 to 25,000 feet). At 1500 GMT a thin layer of altostratus was reported at 3600 meters (,000 feet). Visibility was 11.2 to 25 kilometers.

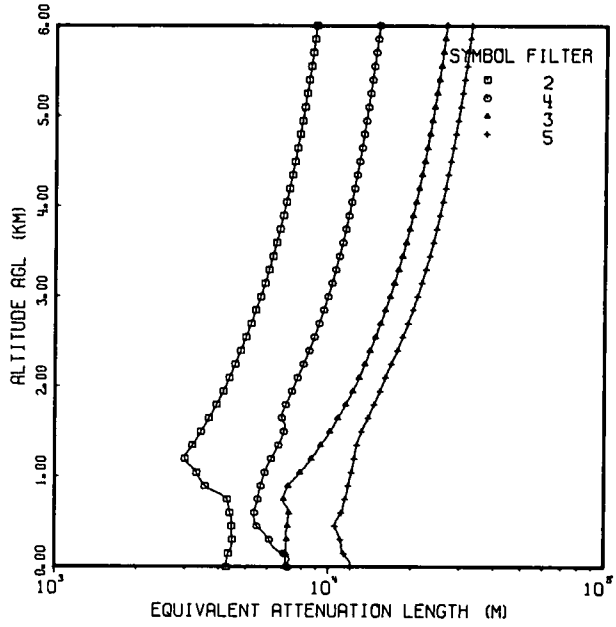
The radiosonde station at Crawley was 157 kilometers east and in an airflow parallel to the track. The vertical cross section showed 4/8 cloud at 900 meters and clear above at 1200 GMT.

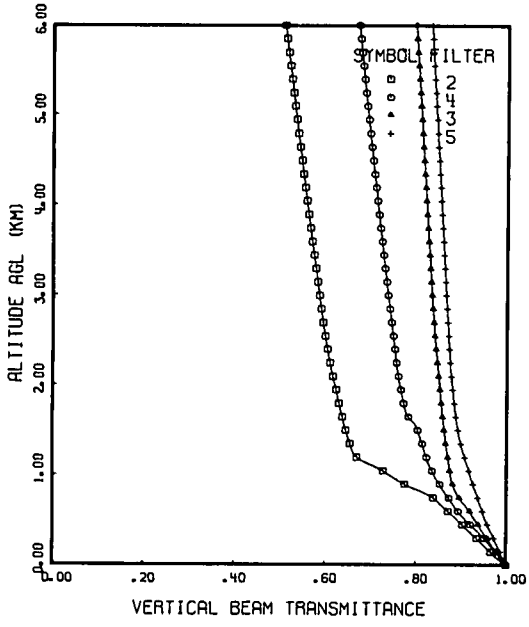
Synoptic Remarks. The surface chart showed a continued ridging over Britain and Ireland from the Atlantic High. There was a low in central Finland with a frontal system that extended southsouthwest to Italy and Algeria. The 500 millibars chart showed a ridge with its axis along 20°W. There was a trough from Sweden south to Germany. Over the flight track the flow was northwesterly. Maritime polar air advected from the Atlantic was modified by passage over England before reaching the flight track.

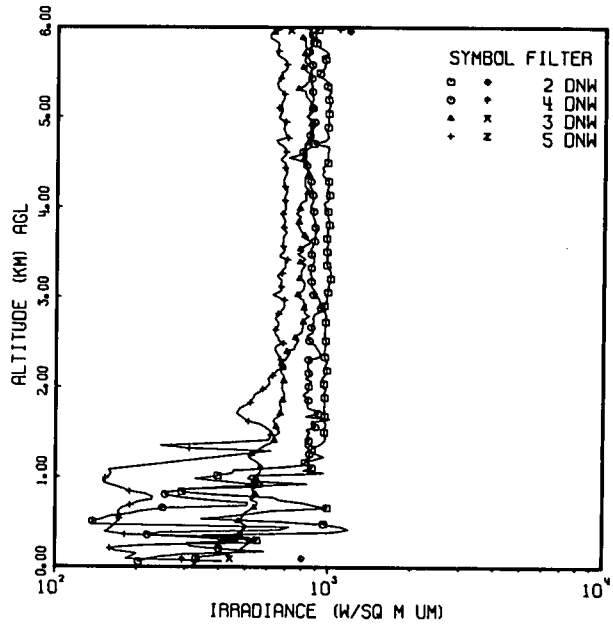
FLIGHT NO. C-448

YEOVILTON









FLIGHT NO. C-448
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6606 DATE 03/29/79)
DATE 31/78 FLIGHT NO. C-448 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(2.35E-04)	(1.41E-04)	(1.44E-04)	(8.34E-05)
30	(2.34E-04)	(1.40E-04)	(1.43E-04)	(8.30E-05)
60	(2.33E-04)	1.40E-04	(1.43E-04)	8.28E-05
90	2.33E-04	1.28E-04	(1.43E-04)	9.06E-05
120	2.32E-04	1.58E-04	(1.42E-04)	9.32E-05
150	2.16E-04	1.81E-04	(1.42E-04)	9.58E-05
180	2.08E-04	1.90E-04	(1.41E-04)	9.56E-05
210	2.13E-04	1.80E-04	(1.41E-04)	8.75E-05
240	2.17E-04	1.84E-04	(1.41E-04)	8.92E-05
270	2.21E-04	1.83E-04	1.40E-04	9.60E-05
300	2.25E-04	1.79E-04	1.34E-04	9.93E-05
330	2.29E-04	1.94E-04	1.55E-04	1.01E-04
360	2.33E-04	2.08E-04	1.45E-04	9.51E-05
390	2.32E-04	2.26E-04	1.35E-04	1.07E-04
420	2.22E-04	2.34E-04	1.23E-04	1.14E-04
450	2.20E-04	2.31E-04	1.37E-04	9.91E-05
480	2.23E-04	1.73E-04	1.41E-04	8.43E-05
510	2.25E-04	2.00E-04	1.38E-04	7.33E-05
540	2.41E-04	2.03E-04	1.35E-04	7.35E-05
570	2.69E-04	1.84E-04	1.22E-04	6.33E-05
600	2.57E-04	1.78E-04	1.33E-04	6.20E-05
630	2.46E-04	1.66E-04	1.88E-04	7.49E-05
660	2.52E-04	1.54E-04	1.41E-04	8.16E-05
690	2.44E-04	1.47E-04	2.49E-04	8.30E-05
720	2.37E-04	1.55E-04	1.42E-04	7.60E-05
750	3.38E-04	1.65E-04	1.46E-04	7.07E-05
780	4.34E-04	1.66E-04	1.36E-04	6.80E-05
810	4.92E-04	1.64E-04	1.18E-04	7.26E-05
840	6.60E-04	1.46E-04	1.02E-04	7.55E-05
870	6.60E-04	1.47E-04	1.00E-04	7.39E-05
900	4.03E-04	1.43E-04	7.84E-05	7.68E-05
930	4.43E-04	1.42E-04	5.94E-05	7.08E-05
960	4.33E-04	1.47E-04	5.26E-05	6.99E-05
990	4.24E-04	1.35E-04	3.77E-05	6.91E-05
1020	4.34E-04	1.29E-04	3.47E-05	6.42E-05
1050	4.00E-04	1.19E-04	3.47E-05	6.58E-05
1080	5.68E-04	1.29E-04	3.57E-05	6.70E-05
1110	6.17E-04	1.11E-04	3.61E-05	6.73E-05
1140	6.63E-04	1.01E-04	3.72E-05	6.77E-05
1170	4.82E-04	8.00E-05	3.73E-05	6.80E-05
1200	4.99E-04	6.99E-05	3.75E-05	6.83E-05
1230	1.60E-04	7.73E-05	3.80E-05	6.86E-05
1260	9.45E-05	8.22E-05	3.83E-05	6.90E-05
1290	9.55E-05	7.35E-05	3.78E-05	6.93E-05
1320	9.40E-05	7.49E-05	3.50E-05	6.37E-05
1350	9.43E-05	7.25E-05	3.32E-05	5.71E-05
1380	9.45E-05	8.52E-05	2.66E-05	5.28E-05
1410	9.77E-05	8.82E-05	2.21E-05	4.70E-05
1440	1.00E-04	7.81E-05	2.27E-05	4.77E-05
1470	9.90E-05	8.99E-05	2.93E-05	4.49E-05
1500	9.96E-05	9.68E-05	3.07E-05	4.00E-05

FLIGHT NO. C-448
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6606 DATE 03/29/79)
DATE 31778 FLIGHT NO. C-448 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	8.53E-05	1.00E-04	3.03E-05	3.49E-05
1560	8.09E-05	8.79E-05	2.97E-05	3.47E-05
1590	7.90E-05	2.70E-04	2.97E-05	3.05E-05
1620	7.67E-05	2.41E-04	2.87E-05	2.77E-05
1650	7.66E-05	2.38E-04	2.57E-05	2.91E-05
1680	7.66E-05	1.15E-04	2.42E-05	3.05E-05
1710	7.53E-05	6.61E-05	2.32E-05	3.03E-05
1740	7.55E-05	5.99E-05	2.22E-05	2.87E-05
1770	7.56E-05	6.19E-05	2.18E-05	2.71E-05
1800	7.67E-05	5.97E-05	2.13E-05	2.67E-05
1830	7.57E-05	5.57E-05	2.13E-05	2.59E-05
1860	6.72E-05	5.21E-05	2.10E-05	2.86E-05
1890	5.87E-05	5.09E-05	2.10E-05	2.78E-05
1920	7.16E-05	5.21E-05	2.15E-05	2.59E-05
1950	7.52E-05	5.23E-05	2.20E-05	2.47E-05
1980	7.60E-05	5.25E-05	2.28E-05	2.47E-05
2010	7.62E-05	5.22E-05	2.21E-05	2.43E-05
2040	7.63E-05	4.79E-05	2.15E-05	2.41E-05
2070	7.65E-05	4.48E-05	2.44E-05	2.51E-05
2100	7.57E-05	4.34E-05	2.26E-05	2.55E-05
2130	7.59E-05	3.99E-05	2.42E-05	2.21E-05
2160	7.63E-05	3.71E-05	2.41E-05	1.94E-05
2190	7.02E-05	3.51E-05	2.42E-05	1.67E-05
2220	6.65E-05	3.51E-05	2.39E-05	1.27E-05
2250	5.65E-05	3.48E-05	2.41E-05	1.32E-05
2280	6.47E-05	3.33E-05	2.44E-05	1.27E-05
2310	6.30E-05	2.43E-05	2.47E-05	1.34E-05
2340	6.10E-05	3.26E-05	2.43E-05	1.40E-05
2370	6.01E-05	3.29E-05	2.38E-05	1.35E-05
2400	5.91E-05	3.25E-05	2.36E-05	1.30E-05
2430	5.68E-05	3.21E-05	1.90E-05	1.38E-05
2460	5.44E-05	3.16E-05	1.91E-05	1.43E-05
2490	5.39E-05	3.36E-05	2.07E-05	1.37E-05
2520	5.29E-05	3.27E-05	1.88E-05	1.30E-05
2550	5.28E-05	3.27E-05	1.80E-05	1.26E-05
2580	5.28E-05	3.32E-05	1.77E-05	1.28E-05
2610	5.29E-05	3.34E-05	1.77E-05	1.27E-05
2640	5.28E-05	3.34E-05	1.67E-05	1.33E-05
2670	5.25E-05	3.23E-05	1.66E-05	1.41E-05
2700	5.25E-05	3.29E-05	1.66E-05	1.30E-05
2730	5.25E-05	3.34E-05	1.66E-05	1.38E-05
2760	5.28E-05	3.33E-05	1.66E-05	1.32E-05
2790	4.26E-05	3.32E-05	1.65E-05	1.33E-05
2820	4.62E-05	2.98E-05	1.65E-05	1.35E-05
2850	4.97E-05	3.24E-05	1.63E-05	1.32E-05
2880	5.08E-05	3.42E-05	1.64E-05	1.36E-05
2910	4.51E-05	3.42E-05	1.59E-05	1.27E-05
2940	3.85E-05	3.37E-05	1.62E-05	1.37E-05
2970	3.97E-05	3.43E-05	1.61E-05	1.32E-05
3000	5.08E-05	3.17E-05	1.63E-05	1.38E-05

FLIGHT NO. C-448
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6606 DATE 03/29/79)
DATE 31778 FLIGHT NO. C-448 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	4.12E-05	2.65E-05	1.60E-05	1.33E-05
3060	3.89E-05	3.34E-05	1.60E-05	1.27E-05
3090	3.88E-05	3.33E-05	1.59E-05	1.26E-05
3120	4.25E-05	3.33E-05	1.58E-05	1.25E-05
3150	4.84E-05	2.94E-05	1.61E-05	1.38E-05
3180	3.79E-05	3.32E-05	1.59E-05	1.28E-05
3210	5.00E-05	3.36E-05	1.59E-05	1.33E-05
3240	4.71E-05	3.38E-05	1.56E-05	1.37E-05
3270	4.94E-05	3.35E-05	1.56E-05	1.32E-05
3300	4.88E-05	3.33E-05	1.57E-05	1.37E-05
3330	4.88E-05	3.31E-05	1.58E-05	1.47E-05
3360	4.93E-05	3.30E-05	1.59E-05	1.23E-05
3390	5.01E-05	3.36E-05	1.59E-05	1.28E-05
3420	4.96E-05	3.32E-05	1.59E-05	1.33E-05
3450	4.93E-05	3.30E-05	1.56E-05	1.39E-05
3480	4.91E-05	3.31E-05	1.57E-05	1.31E-05
3510	4.85E-05	3.30E-05	1.55E-05	1.30E-05
3540	4.65E-05	3.07E-05	1.55E-05	1.29E-05
3570	4.89E-05	3.27E-05	1.57E-05	1.27E-05
3600	4.91E-05	3.30E-05	1.58E-05	1.42E-05
3630	4.85E-05	3.28E-05	1.54E-05	1.40E-05
3660	4.84E-05	3.27E-05	1.55E-05	1.39E-05
3690	4.78E-05	3.25E-05	1.55E-05	1.35E-05
3720	4.82E-05	3.17E-05	1.54E-05	1.33E-05
3750	4.89E-05	3.26E-05	1.54E-05	1.34E-05
3780	4.56E-05	3.27E-05	1.53E-05	1.34E-05
3810	4.52E-05	3.22E-05	1.55E-05	1.39E-05
3840	4.75E-05	3.24E-05	1.52E-05	1.26E-05
3870	4.81E-05	3.20E-05	1.55E-05	1.31E-05
3900	4.72E-05	3.19E-05	1.52E-05	1.44E-05
3930	4.73E-05	3.19E-05	1.54E-05	1.34E-05
3960	4.66E-05	3.18E-05	1.51E-05	1.34E-05
3990	4.71E-05	3.17E-05	1.55E-05	1.32E-05
4020	4.74E-05	3.15E-05	1.53E-05	1.39E-05
4050	4.78E-05	3.19E-05	1.52E-05	1.60E-05
4080	4.76E-05	3.19E-05	1.52E-05	1.45E-05
4110	4.69E-05	3.17E-05	1.52E-05	1.29E-05
4140	4.74E-05	3.16E-05	1.52E-05	1.50E-05
4170	4.78E-05	3.15E-05	1.53E-05	1.39E-05
4200	4.68E-05	3.16E-05	1.51E-05	1.36E-05
4230	4.67E-05	3.14E-05	1.50E-05	1.39E-05
4260	4.66E-05	3.15E-05	1.51E-05	1.38E-05
4290	4.66E-05	3.15E-05	1.52E-05	1.37E-05
4320	4.66E-05	3.14E-05	1.52E-05	1.33E-05
4350	4.65E-05	3.14E-05	1.53E-05	1.28E-05
4380	4.66E-05	3.13E-05	1.54E-05	1.56E-05
4410	4.69E-05	3.15E-05	1.54E-05	1.32E-05
4440	4.77E-05	3.13E-05	1.56E-05	1.31E-05
4470	4.76E-05	3.18E-05	1.55E-05	1.30E-05
4500	4.74E-05	3.12E-05	1.53E-05	1.44E-05

FLIGHT NO. C-448
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6606 DATE 03/29/79)
DATE 31778 FLIGHT NO. C-448 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
4530	4.74E-05	3.13E-05	1.51E-05	1.27E-05
4560	4.75E-05	3.16E-05	1.53E-05	1.32E-05
4590	4.76E-05	3.11E-05	1.57E-05	1.37E-05
4620	4.77E-05	3.16E-05	1.55E-05	1.28E-05
4650	4.76E-05	3.15E-05	1.55E-05	1.43E-05
4680	4.75E-05	3.15E-05	1.55E-05	1.32E-05
4710	4.66E-05	3.14E-05	1.53E-05	1.38E-05
4740	4.67E-05	3.14E-05	1.56E-05	1.27E-05
4770	4.66E-05	3.12E-05	1.58E-05	1.24E-05
4800	4.64E-05	3.30E-05	1.56E-05	1.34E-05
4830	4.63E-05	3.28E-05	1.53E-05	1.44E-05
4860	4.61E-05	3.24E-05	1.54E-05	1.40E-05
4890	4.74E-05	3.28E-05	1.55E-05	1.36E-05
4920	4.68E-05	3.32E-05	1.54E-05	1.32E-05
4950	4.68E-05	3.29E-05	1.57E-05	1.30E-05
4980	4.55E-05	3.24E-05	1.54E-05	1.36E-05
5010	4.51E-05	3.21E-05	1.51E-05	1.40E-05
5040	4.66E-05	3.17E-05	1.50E-05	1.31E-05
5070	4.88E-05	3.09E-05	1.50E-05	1.44E-05
5100	4.69E-05	3.08E-05	1.45E-05	1.41E-05
5130	4.55E-05	3.15E-05	1.48E-05	1.39E-05
5160	4.42E-05	3.09E-05	1.46E-05	1.39E-05
5190	4.46E-05	3.08E-05	1.46E-05	1.33E-05
5220	4.45E-05	3.10E-05	1.47E-05	1.30E-05
5250	4.52E-05	3.12E-05	1.56E-05	1.33E-05
5280	4.46E-05	3.10E-05	1.66E-05	1.37E-05
5310	4.53E-05	3.03E-05	1.47E-05	1.33E-05
5340	4.51E-05	3.01E-05	1.46E-05	1.34E-05
5370	4.56E-05	3.03E-05	1.47E-05	1.34E-05
5400	4.49E-05	2.99E-05	1.47E-05	1.37E-05
5430	4.44E-05	2.97E-05	1.47E-05	1.40E-05
5460	4.53E-05	2.97E-05	1.53E-05	1.32E-05
5490	4.60E-05	2.97E-05	1.59E-05	1.42E-05
5520	4.72E-05	2.97E-05	1.65E-05	1.32E-05
5550	4.77E-05	2.99E-05	1.63E-05	1.33E-05
5580	4.86E-05	3.01E-05	1.59E-05	1.33E-05
5610	4.81E-05	2.97E-05	1.62E-05	1.32E-05
5640	4.75E-05	2.96E-05	1.62E-05	1.40E-05
5670	4.66E-05	2.95E-05	1.71E-05	1.34E-05
5700	4.82E-05	2.94E-05	1.66E-05	1.28E-05
5730	5.09E-05	2.94E-05	1.69E-05	1.46E-05
5760	5.22E-05	2.95E-05	1.75E-05	1.37E-05
5790	5.35E-05	2.94E-05	1.75E-05	1.28E-05
5820	5.38E-05	2.95E-05	1.82E-05	1.34E-05
5850	5.10E-05	2.94E-05	1.82E-05	1.33E-05
5880	5.43E-05	2.94E-05	1.82E-05	1.33E-05
5910	5.38E-05	2.94E-05	(1.81E-05)	1.91E-05
5940	5.27E-05	2.94E-05	(1.81E-05)	1.70E-05
5970	4.73E-05	2.95E-05	(1.80E-05)	1.49E-05
6000	(4.71E-05)	3.00E-05	(1.79E-05)	(1.49E-05)
FIRST DATA ALT	90	60	270	60
LAST DATA ALT	5970	6000	5880	5970

FLIGHT NO. C-448
EQUIVALENT ATTENUATION LENGTH

(JOB 6606 DATE 03/29/79)
DATE 31778 FLIGHT NO. C-448 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(4.26E 03)	(7.09E 03)	(6.94E 03)	(1.20E 04)
300	4.47E 03	6.08E 03	7.07E 03	1.10E 04
600	4.38E 03	5.37E 03	7.20E 03	1.11E 04
900	3.54E 03	5.66E 03	7.13E 03	1.18E 04
1200	2.99E 03	6.17E 03	8.64E 03	1.24E 04
1500	3.42E 03	6.87E 03	1.01E 04	1.32E 04
1800	3.90E 03	6.97E 03	1.15E 04	1.46E 04
2100	4.34E 03	7.68E 03	1.29E 04	1.60E 04
2400	4.76E 03	8.46E 03	1.41E 04	1.77E 04
2700	5.19E 03	9.20E 03	1.54E 04	1.93E 04
3000	5.62E 03	9.89E 03	1.66E 04	2.09E 04
3300	6.03E 03	1.05E 04	1.78E 04	2.24E 04
3600	6.41E 03	1.11E 04	1.89E 04	2.38E 04
3900	6.77E 03	1.17E 04	2.00E 04	2.51E 04
4200	7.11E 03	1.23E 04	2.11E 04	2.63E 04
4500	7.44E 03	1.28E 04	2.21E 04	2.75E 04
4800	7.76E 03	1.33E 04	2.30E 04	2.86E 04
5100	8.06E 03	1.38E 04	2.39E 04	2.97E 04
5400	8.36E 03	1.42E 04	2.48E 04	3.07E 04
5700	8.63E 03	1.47E 04	2.56E 04	3.17E 04
6000	(8.88E 03)	(1.51E 04)	(2.64E 04)	(3.25E 04)

FLIGHT NO. C-448
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

$\tau_R = 0.0244$

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.35E-01	9.52E-01	9.58E-01	9.73E-01
600	8.72E-01	8.94E-01	9.20E-01	9.48E-01
900	7.76E-01	8.53E-01	8.81E-01	9.27E-01
1200	6.69E-01	8.23E-01	8.70E-01	9.08E-01
1500	6.45E-01	8.04E-01	8.62E-01	8.92E-01
1800	6.30E-01	7.73E-01	8.55E-01	8.84E-01
2100	6.16E-01	7.61E-01	8.50E-01	8.77E-01
2400	6.04E-01	7.53E-01	8.44E-01	8.73E-01
2700	5.95E-01	7.46E-01	8.39E-01	8.70E-01
3000	5.86E-01	7.38E-01	8.35E-01	8.66E-01
3300	5.79E-01	7.31E-01	8.31E-01	8.63E-01
3600	5.70E-01	7.24E-01	8.27E-01	8.59E-01
3900	5.62E-01	7.17E-01	8.23E-01	8.56E-01
4200	5.54E-01	7.10E-01	8.19E-01	8.52E-01
4500	5.46E-01	7.04E-01	8.16E-01	8.49E-01
4800	5.39E-01	6.97E-01	8.12E-01	8.45E-01
5100	5.31E-01	6.90E-01	8.08E-01	8.42E-01
5400	5.24E-01	6.84E-01	8.05E-01	8.39E-01
5700	5.17E-01	6.78E-01	8.01E-01	8.35E-01
6000	(5.09E-01)	(6.72E-01)	(7.96E-01)	(8.32E-01)

FLIGHT C-449 - 18 MARCH 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	0945	1122	1.62	61.3	-	53.2	4590	60
4,5	1126	1316	1.83	53.1	51.9	53.4	6180	60

Flight Description. Flight C-449 was a midday flight spanning local apparent noon with take off at 0858 and landing at 1420 GMT. There were multiple layers of broken clouds. The approximate east to west Yeovilton track was located between Bournemouth Hurn and Yeovilton near the south central coast of England. Typical terrain features were rolling green fields interspersed with occasional brown fields and small towns. The track was shifted after the first 1100 meter (3500 foot) level to avoid a cumulus field. The last 6100 meter (20,000 foot) run was along the coast with water to the south and land to the north.

In-Flight Notes. The in-flight observer noted at 0936 GMT that cumulus was forming rapidly over the highlands to the east. At 0945 GMT there were scattered cumulus at 610 meters (2000 feet) in mid track, thin broken cirrus at 6100 meters (20,000 feet) and light haze with slant visibility 16 kilometers (10 miles). At 1008 GMT there were scattered cumulus at 760 meters (2500 feet) from the middle to the eastern end of the track as well as broken cirrus at 6100 meters (20,000 feet), slant range visibility was 24 kilometers (15 miles). At 1025 GMT the track was shifted to the west over a clear area with altostratus to the west at 1500 meters (5000 feet) and visibility 40 kilometers (25 miles). At 1055 GMT altostratus to the north was sliding south and cumulus east and south was forcing the flight to be squeezed into a clear narrow band between the decks. At 1130 GMT the flight was back on track but at 1150 GMT the track was rotated 24-06 orientation between two lines of clouds. Haze top was 1500 meters (5000 feet) and the layers above were very thin. At 1215 GMT the flight was between altostratus to the north and cumulus to the south with the clear area decreasing. At 1315 GMT the cloud layer had bases at 1200 meters (3800 feet) and tops at 1300 meters (4200 feet) with haze below.

Local Weather Notes. Boscombe Down, 55 kilometers northeast of the track center, reported 3/8 to 7/8 cirrus at 7500 meters (25,000 feet) with cumulus forming after 1100 GMT and increasing to 5/8 by 1400 GMT with bases at 1350 meters (4500 feet). Visibility was 8 to 30 kilometers.

Yeovilton, 15 kilometers northwest of the track center, observed cumulus and stratocumulus in amounts varying from 4/8 to 7/8 and bases varying from 600 to 750 meters (2000 to 2500 feet), and 5/8 to 6/8 cirrus at 6000 meters (20,000 feet). Visibility was 10 to 14 kilometers in haze.

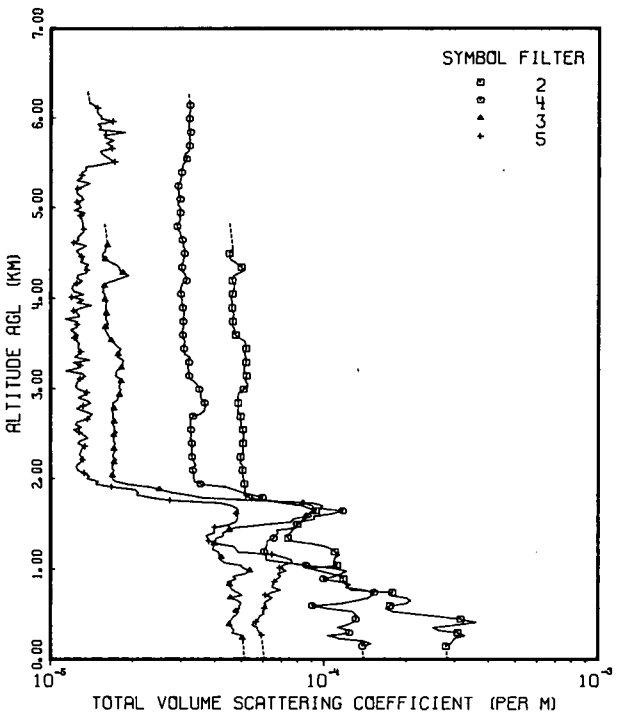
Bournemouth Hurn, 46 kilometers eastsoutheast of the track center, reported 1/8 cumulus at 1200 meters (4000 feet) increasing to 5/8 and bases lowering to 1050 meters (3500 feet) at 1300 GMT. There was also 4/8 to 6/8 cirrus at 7500 meters (25,000 feet). Visibility of 6 to 8 kilometers in haze improved to 18 to 30 kilometers by 1100 GMT.

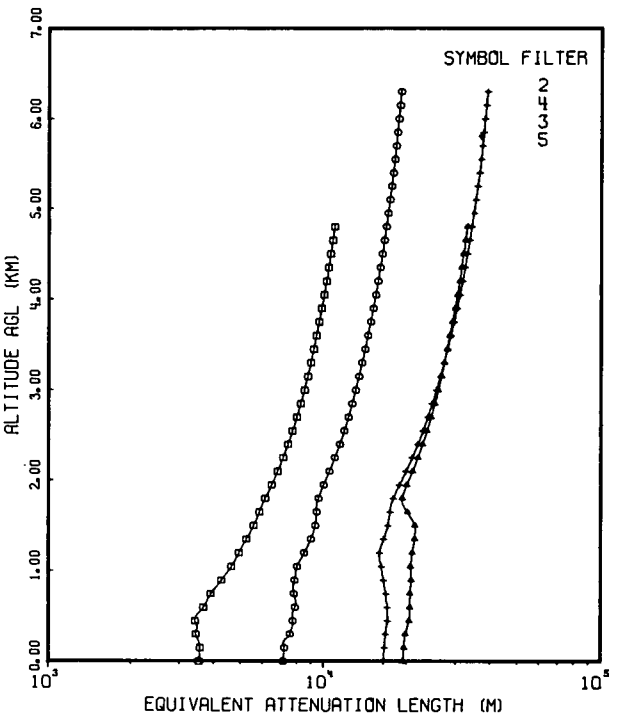
The radiosonde station at Crawley was 157 kilometers east and in an airflow that was generally parallel to the track. Data from a vertical cross section were not available for this area.

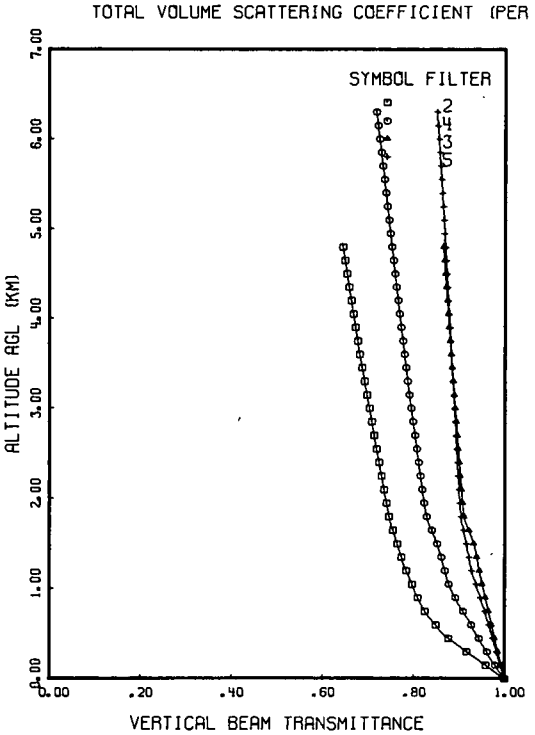
Synoptic Remarks. The surface chart showed a low centered in northern Italy that had no associated frontal system. Ridging from the Atlantic continued from Spain to Great Britain and western Germany. Over the flight path the flow was westsouthwest from the North Atlantic. At 500 millibars there was increasing ridging in the Irish Sea with a strong northnorthwesterly flow at this level. The air mass was unstable maritime polar.

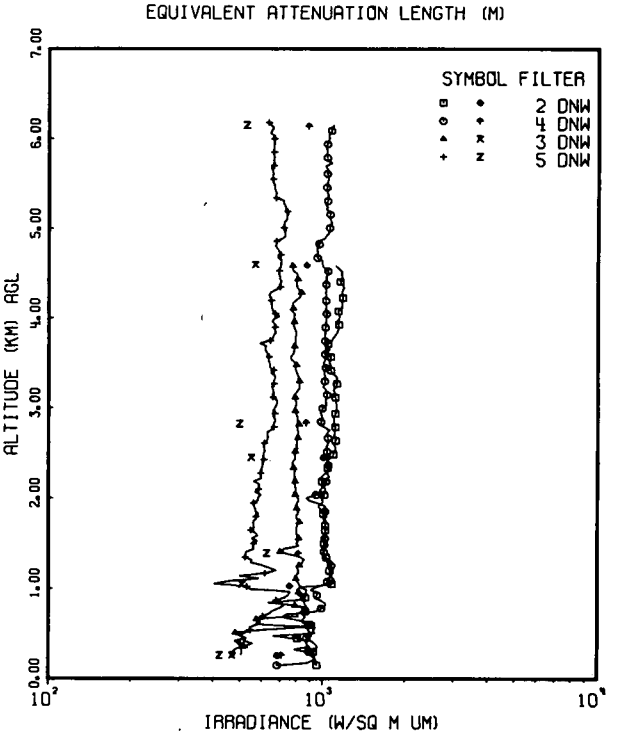
FLIGHT NO. C-449

YEOVILTON









FLIGHT NO. C-449
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6637 DATE 03/29/79)
DATE 31878 FLIGHT NO. C-449 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(2.83E-04)	(1.40E-04)	(5.15E-05)	(6.07E-05)
30	(2.82E-04)	(1.39E-04)	(5.13E-05)	(6.04E-05)
60	(2.81E-04)	(1.39E-04)	(5.11E-05)	(6.02E-05)
90	(2.80E-04)	(1.39E-04)	(5.10E-05)	(6.01E-05)
120	(2.80E-04)	(1.38E-04)	(5.09E-05)	(5.99E-05)
150	2.79E-04	1.38E-04	(5.07E-05)	(5.98E-05)
180	2.90E-04	1.48E-04	(5.06E-05)	(5.96E-05)
210	2.96E-04	1.38E-04	(5.05E-05)	(5.95E-05)
240	3.00E-04	1.12E-04	5.04E-05	(5.93E-05)
270	3.20E-04	1.03E-04	5.04E-05	5.92E-05
300	3.05E-04	1.23E-04	4.59E-05	5.81E-05
330	2.61E-04	1.23E-04	4.69E-05	5.72E-05
360	2.50E-04	1.12E-04	4.60E-05	5.72E-05
390	3.03E-04	1.21E-04	4.50E-05	5.44E-05
420	3.59E-04	1.28E-04	4.52E-05	5.63E-05
450	3.15E-04	1.31E-04	4.58E-05	5.76E-05
480	2.67E-04	1.32E-04	4.67E-05	5.79E-05
510	2.15E-04	1.30E-04	4.83E-05	6.02E-05
540	1.77E-04	1.26E-04	4.77E-05	5.96E-05
570	1.68E-04	1.04E-04	4.91E-05	6.05E-05
600	1.74E-04	9.05E-05	4.90E-05	6.14E-05
630	1.99E-04	1.17E-04	4.98E-05	6.05E-05
660	2.08E-04	1.31E-04	4.86E-05	6.24E-05
690	2.00E-04	1.45E-04	4.55E-05	6.47E-05
720	1.74E-04	1.50E-04	5.03E-05	6.10E-05
750	1.73E-04	1.53E-04	4.83E-05	6.44E-05
780	1.25E-04	1.39E-04	4.63E-05	6.95E-05
810	1.21E-04	1.20E-04	4.54E-05	6.45E-05
840	1.20E-04	1.25E-04	4.52E-05	6.52E-05
870	1.18E-04	1.14E-04	4.44E-05	6.58E-05
900	1.14E-04	9.94E-05	4.78E-05	6.73E-05
930	1.15E-04	1.09E-04	4.64E-05	6.93E-05
960	1.05E-04	1.15E-04	5.16E-05	6.75E-05
990	9.59E-05	1.21E-04	5.36E-05	7.27E-05
1020	9.69E-05	1.08E-04	5.06E-05	6.90E-05
1050	1.11E-04	8.59E-05	5.00E-05	7.09E-05
1080	1.09E-04	7.32E-05	4.33E-05	7.61E-05
1110	1.09E-04	6.16E-05	4.17E-05	7.59E-05
1140	1.10E-04	6.13E-05	4.22E-05	7.08E-05
1170	1.14E-04	6.13E-05	4.14E-05	6.46E-05
1200	1.09E-04	6.03E-05	4.11E-05	4.83E-05
1230	1.07E-04	6.09E-05	3.90E-05	4.75E-05
1260	1.01E-04	6.15E-05	3.95E-05	4.68E-05
1290	9.01E-05	6.20E-05	3.97E-05	4.10E-05
1320	7.65E-05	6.19E-05	3.98E-05	3.80E-05
1350	7.35E-05	6.54E-05	4.05E-05	3.76E-05
1380	7.28E-05	6.64E-05	4.29E-05	3.70E-05
1410	7.54E-05	6.79E-05	4.26E-05	3.97E-05
1440	7.64E-05	6.71E-05	4.51E-05	3.94E-05
1470	7.85E-05	7.93E-05	4.78E-05	3.98E-05
1500	8.00E-05	7.96E-05	5.98E-05	4.50E-05

FLIGHT NO. C-449
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6637 DATE 03/29/79)
DATE 31878 FLIGHT NO. C-449 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	8.24E-05	8.18E-05	7.61E-05	4.75E-05
1560	8.39E-05	9.23E-05	7.71E-05	4.81E-05
1590	9.00E-05	9.16E-05	8.61E-05	4.84E-05
1620	8.86E-05	1.07E-04	8.83E-05	4.76E-05
1650	9.34E-05	1.17E-04	9.05E-05	4.85E-05
1680	8.81E-05	9.67E-05	9.11E-05	4.80E-05
1710	8.30E-05	9.91E-05	9.04E-05	4.58E-05
1740	7.11E-05	9.04E-05	8.36E-05	4.16E-05
1770	6.21E-05	5.83E-05	5.56E-05	2.74E-05
1800	5.31E-05	5.96E-05	3.55E-05	2.33E-05
1830	5.09E-05	5.41E-05	3.17E-05	2.06E-05
1860	5.13E-05	4.96E-05	2.75E-05	2.09E-05
1890	5.16E-05	4.66E-05	2.50E-05	2.04E-05
1920	5.11E-05	4.36E-05	2.29E-05	1.67E-05
1950	5.10E-05	3.53E-05	1.91E-05	1.46E-05
1980	5.09E-05	3.35E-05	1.72E-05	1.50E-05
2010	5.07E-05	3.35E-05	1.69E-05	1.36E-05
2040	5.05E-05	3.33E-05	1.69E-05	1.39E-05
2070	5.01E-05	3.32E-05	1.68E-05	1.33E-05
2100	5.03E-05	3.31E-05	1.71E-05	1.26E-05
2130	5.06E-05	3.28E-05	1.68E-05	1.25E-05
2160	5.02E-05	3.40E-05	1.69E-05	1.25E-05
2190	4.94E-05	3.35E-05	1.71E-05	1.29E-05
2220	4.98E-05	3.32E-05	1.75E-05	1.31E-05
2250	4.94E-05	3.29E-05	1.69E-05	1.29E-05
2280	5.00E-05	3.31E-05	1.69E-05	1.28E-05
2310	5.06E-05	3.29E-05	1.72E-05	1.29E-05
2340	5.04E-05	3.29E-05	1.71E-05	1.30E-05
2370	5.04E-05	3.30E-05	1.71E-05	1.33E-05
2400	5.05E-05	3.28E-05	1.73E-05	1.25E-05
2430	5.00E-05	3.28E-05	1.70E-05	1.29E-05
2460	5.08E-05	3.25E-05	1.70E-05	1.37E-05
2490	5.09E-05	3.27E-05	1.70E-05	1.32E-05
2520	5.03E-05	3.25E-05	1.76E-05	1.27E-05
2550	5.04E-05	3.25E-05	1.70E-05	1.21E-05
2580	4.97E-05	3.27E-05	1.71E-05	1.30E-05
2610	4.99E-05	3.24E-05	1.69E-05	1.23E-05
2640	4.95E-05	3.26E-05	1.71E-05	1.25E-05
2670	4.92E-05	3.24E-05	1.71E-05	1.36E-05
2700	4.94E-05	3.31E-05	1.68E-05	1.39E-05
2730	4.92E-05	3.53E-05	1.70E-05	1.42E-05
2760	4.84E-05	3.63E-05	1.68E-05	1.32E-05
2790	4.84E-05	3.66E-05	1.70E-05	1.24E-05
2820	4.83E-05	3.68E-05	1.71E-05	1.31E-05
2850	4.84E-05	3.65E-05	1.68E-05	1.41E-05
2880	4.87E-05	3.58E-05	1.74E-05	1.35E-05
2910	4.83E-05	3.54E-05	1.77E-05	1.26E-05
2940	4.34E-05	3.54E-05	1.78E-05	1.33E-05
2970	4.89E-05	3.55E-05	1.78E-05	1.36E-05
3000	5.07E-05	3.49E-05	1.81E-05	1.27E-05

FLIGHT NO. C-449
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6637 DATE 03/29/79)
DATE 31878 FLIGHT NO. C-449 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	5.26E-05	3.46E-05	1.78E-05	1.24E-05
3060	5.24E-05	3.42E-05	1.79E-05	1.25E-05
3090	5.16E-05	3.35E-05	1.81E-05	1.26E-05
3120	5.16E-05	3.22E-05	1.79E-05	1.28E-05
3150	5.20E-05	3.21E-05	1.72E-05	1.34E-05
3180	5.18E-05	3.20E-05	1.74E-05	1.30E-05
3210	5.09E-05	3.19E-05	1.74E-05	1.13E-05
3240	5.11E-05	3.17E-05	1.81E-05	1.26E-05
3270	5.14E-05	3.19E-05	1.82E-05	1.28E-05
3300	5.17E-05	3.20E-05	1.84E-05	1.21E-05
3330	5.15E-05	3.16E-05	1.84E-05	1.39E-05
3360	5.17E-05	3.23E-05	1.75E-05	1.22E-05
3390	5.12E-05	3.08E-05	1.77E-05	1.27E-05
3420	5.12E-05	3.07E-05	1.78E-05	1.29E-05
3450	5.18E-05	3.07E-05	1.81E-05	1.26E-05
3480	5.15E-05	3.07E-05	1.74E-05	1.26E-05
3510	5.15E-05	3.08E-05	1.70E-05	1.27E-05
3540	5.09E-05	3.09E-05	1.66E-05	1.25E-05
3570	4.86E-05	3.05E-05	1.64E-05	1.22E-05
3600	4.74E-05	3.04E-05	1.62E-05	1.26E-05
3630	4.60E-05	3.04E-05	1.60E-05	1.22E-05
3660	4.71E-05	3.02E-05	1.58E-05	1.18E-05
3690	4.63E-05	3.06E-05	1.59E-05	1.25E-05
3720	4.61E-05	3.05E-05	1.63E-05	1.25E-05
3750	4.62E-05	3.05E-05	1.61E-05	1.25E-05
3780	4.63E-05	3.05E-05	1.59E-05	1.12E-05
3810	4.65E-05	3.07E-05	1.59E-05	1.28E-05
3840	4.67E-05	3.08E-05	1.60E-05	1.25E-05
3870	4.60E-05	3.06E-05	1.59E-05	1.22E-05
3900	4.59E-05	3.03E-05	1.59E-05	1.29E-05
3930	4.59E-05	3.05E-05	1.59E-05	1.41E-05
3960	4.61E-05	3.01E-05	1.60E-05	1.25E-05
3990	4.58E-05	3.02E-05	1.58E-05	1.32E-05
4020	4.56E-05	3.00E-05	1.58E-05	1.19E-05
4050	4.61E-05	2.99E-05	1.58E-05	1.32E-05
4080	4.65E-05	2.96E-05	1.54E-05	1.22E-05
4110	4.68E-05	2.99E-05	1.56E-05	1.20E-05
4140	4.68E-05	3.00E-05	1.57E-05	1.20E-05
4170	4.68E-05	3.03E-05	1.58E-05	1.24E-05
4200	4.61E-05	3.14E-05	1.70E-05	1.30E-05
4230	4.62E-05	3.14E-05	1.80E-05	1.25E-05
4260	4.67E-05	3.11E-05	1.93E-05	1.25E-05
4290	4.89E-05	3.07E-05	1.84E-05	1.35E-05
4320	5.11E-05	3.01E-05	1.79E-05	1.36E-05
4350	4.97E-05	3.01E-05	1.78E-05	1.33E-05
4380	4.64E-05	3.01E-05	1.74E-05	1.38E-05
4410	4.69E-05	3.05E-05	1.65E-05	1.28E-05
4440	4.53E-05	3.06E-05	1.58E-05	1.32E-05
4470	4.51E-05	3.08E-05	1.54E-05	1.30E-05
4500	4.49E-05	3.09E-05	1.56E-05	1.27E-05

FLIGHT NO. C-449
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6637 DATE 03/29/79)
DATE 31878 FLIGHT NO. C-449 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M)			
FILTERS	2	4	3	5
4530	4.61E-05	3.08E-05	1.58E-05	1.24E-05
4560	4.61E-05	3.08E-05	1.59E-05	1.29E-05
4590	4.61E-05	3.05E-05	1.61E-05	1.35E-05
4620	(4.60E-05)	3.06E-05	(1.61E-05)	1.21E-05
4650	(4.59E-05)	3.03E-05	(1.60E-05)	1.26E-05
4680	(4.57E-05)	2.99E-05	(1.60E-05)	1.25E-05
4710	(4.56E-05)	2.98E-05	(1.59E-05)	1.28E-05
4740	(4.54E-05)	2.96E-05	(1.59E-05)	1.31E-05
4770	(4.53E-05)	2.92E-05	(1.58E-05)	1.32E-05
4800	(4.51E-05)	2.90E-05	(1.58E-05)	1.30E-05
4830		2.92E-05		1.31E-05
4860		2.96E-05		1.31E-05
4890		2.97E-05		1.29E-05
4920		2.96E-05		1.28E-05
4950		2.97E-05		1.33E-05
4980		2.99E-05		1.22E-05
5010		2.97E-05		1.29E-05
5040		2.92E-05		1.27E-05
5070		2.93E-05		1.24E-05
5100		2.97E-05		1.32E-05
5130		2.97E-05		1.30E-05
5160		2.94E-05		1.25E-05
5190		2.94E-05		1.25E-05
5220		2.90E-05		1.25E-05
5250		2.92E-05		1.32E-05
5280		2.97E-05		1.39E-05
5310		2.98E-05		1.24E-05
5340		3.00E-05		1.29E-05
5370		3.01E-05		1.30E-05
5400		3.01E-05		1.30E-05
5430		3.01E-05		1.35E-05
5460		3.03E-05		1.34E-05
5490		3.05E-05		1.53E-05
5520		3.09E-05		1.71E-05
5550		3.14E-05		1.64E-05
5580		3.09E-05		1.59E-05
5610		3.09E-05		1.54E-05
5640		3.19E-05		1.51E-05
5670		3.21E-05		1.67E-05
5700		3.22E-05		1.65E-05
5730		3.22E-05		1.59E-05
5760		3.22E-05		1.70E-05
5790		3.22E-05		1.57E-05
5820		3.21E-05		1.59E-05
5850		3.24E-05		1.87E-05
5880		3.20E-05		1.50E-05
5910		3.20E-05		1.53E-05
5940		3.20E-05		1.48E-05
5970		3.21E-05		1.68E-05
6000		3.21E-05		1.53E-05

FLIGHT NO. C-449
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6637 DATE 03/29/79)
DATE 31878 FLIGHT NO. C-449 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	FILTERS	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) 2	4	3	5
6030			3.19E-05		1.54E-05
6060			3.21E-05		1.48E-05
6090			3.23E-05		1.48E-05
6120			3.23E-05		1.48E-05
6150			3.23E-05		1.43E-05
6180			(3.22E-05)		1.38E-05
6210			(3.21E-05)		(1.38E-05)
6240			(3.20E-05)		(1.37E-05)
6270			(3.19E-05)		(1.37E-05)
6300			(3.18E-05)		(1.36E-05)
FIRST DATA ALT		120	150	240	270
LAST DATA ALT		4590	6150	4590	6180

FLIGHT NO. C-449
EQUIVALENT ATTENUATION LENGTH

(JOB 6637 DATE 03/29/79)
DATE 31878 FLIGHT NO. C-449 GROUND LEVEL ALTITUDE (M)= 60

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(3.53E 03)	(7.14E 03)	(1.94E 04)	(1.65E 04)
300	3.44E 03	7.54E 03	1.98E 04	1.67E 04
600	3.66E 03	7.87E 03	2.05E 04	1.70E 04
900	4.25E 03	7.83E 03	2.07E 04	1.65E 04
1200	4.92E 03	8.50E 03	2.09E 04	1.59E 04
1500	5.57E 03	9.31E 03	2.14E 04	1.71E 04
1800	6.13E 03	9.57E 03	1.92E 04	1.78E 04
2100	6.80E 03	1.05E 04	2.09E 04	1.98E 04
2400	7.41E 03	1.14E 04	2.28E 04	2.19E 04
2700	7.97E 03	1.23E 04	2.44E 04	2.37E 04
3000	8.49E 03	1.30E 04	2.59E 04	2.55E 04
3300	8.95E 03	1.37E 04	2.72E 04	2.72E 04
3600	9.37E 03	1.44E 04	2.85E 04	2.87E 04
3900	9.80E 03	1.50E 04	2.97E 04	3.02E 04
4200	1.02E 04	1.57E 04	3.09E 04	3.16E 04
4500	1.06E 04	1.62E 04	3.19E 04	3.29E 04
4800	(1.09E 04)	1.68E 04	(3.29E 04)	3.42E 04
5100		1.73E 04		3.53E 04
5400		1.78E 04		3.64E 04
5700		1.82E 04		3.73E 04
6000		1.86E 04		3.81E 04
6300		(1.89E 04)		(3.89E 04)

FLIGHT NO. C-449
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

$T_{R1} = 0.0325$

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.16E-01	9.61E-01	9.85E-01	9.82E-01
600	8.49E-01	9.27E-01	9.71E-01	9.65E-01
900	8.09E-01	8.91E-01	9.58E-01	9.47E-01
1200	7.84E-01	8.69E-01	9.44E-01	9.27E-01
1500	7.64E-01	8.51E-01	9.32E-01	9.16E-01
1800	7.46E-01	8.29E-01	9.11E-01	9.04E-01
2100	7.34E-01	8.18E-01	9.05E-01	8.99E-01
2400	7.23E-01	8.10E-01	9.00E-01	8.96E-01
2700	7.13E-01	8.02E-01	8.95E-01	8.93E-01
3000	7.02E-01	7.94E-01	8.91E-01	8.89E-01
3300	6.91E-01	7.86E-01	8.86E-01	8.86E-01
3600	6.81E-01	7.79E-01	8.81E-01	8.82E-01
3900	6.72E-01	7.72E-01	8.77E-01	8.79E-01
4200	6.62E-01	7.65E-01	8.73E-01	8.76E-01
4500	6.53E-01	7.58E-01	8.68E-01	8.72E-01
4800	(6.44E-01)	7.51E-01	(8.64E-01)	8.69E-01
5100		7.44E-01		8.66E-01
5400		7.38E-01		8.62E-01
5700		7.31E-01		8.58E-01
6000		7.24E-01		8.54E-01
6300		(7.17E-01)		(8.50E-01)

FLIGHT C-450A - 22 MARCH 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	0945	1020	0.58	57.2	-	54.4	4020	6
4	1023	1040	0.28	54.1	-	53.1	3990	6
5	1042	1056	0.23	53.0	-	52.4	4020	6

Flight Description. Flight C-450A was the first third of a triple mission. It was a morning flight with take off at 0852 and data tape ending about 1055 GMT. There were multiple layers of scattered to broken clouds with broken cirrus at the highest level. The approximate east to west Soesterberg track was located between Deelen and DeBilt in central Netherlands. Typical terrain features were green fields interspersed with occasional brown fields and small towns.

In-Flight Notes. The in-flight observer noted that an approaching frontal system was moving mid level clouds into the area rapidly and would bring rain in a few hours. Over the area there were scattered cumulus at 460 meters (1500 feet), broken altostratus at 4000 meters (13,000 feet), and broken cirrus at 7600 meters (25,000 feet). There was moderate haze to 460 meters (1500 feet) and light haze to 2100 meters (7000 feet). Slant visibility was 9.6 kilometers (6 miles). At 1005 GMT cumulus bases were at 520 meters (1700 feet) and tops at 940 meters (3100 feet), slant visibility was 24 kilometers (15 miles). At 1100 GMT the flight was occasionally over a large cumulus cell and the cumulus coverage increased by 1125 GMT. By 1210 GMT there was increasing density in the altostratus layer overhead and the cumulus field was being surpressed in the heavier shadow. Slant range visibility decreased to 11 kilometers (7 miles) by 1210 GMT.

Local Weather Notes. DeBilt, 32 kilometers northwest of the track center, reported 2/8 to 3/8 cumulus at 450 to 600 meters (1500 to 2000 feet), 3/8 to 4/8 altocumulus at 3000 meters (10,000 feet), and 6/8 to 7/8 cirrus at 6000 meters (20,000 feet). Visibility of 5 kilometers in fog improved to 7 to 10 kilometers in haze.

Soesterberg, 30 kilometers northwest of the track center, reported 2/8 to 5/8 cumulus varying in altitude from 360 to 600 meters (1200 to 2000 feet), 4/8 to 6/8 altocumulus at 3000 meters (10,000 feet), and 7/8 cirrus at 6000 meters (20,000 feet). Visibility was 11.2 to 16 kilometers.

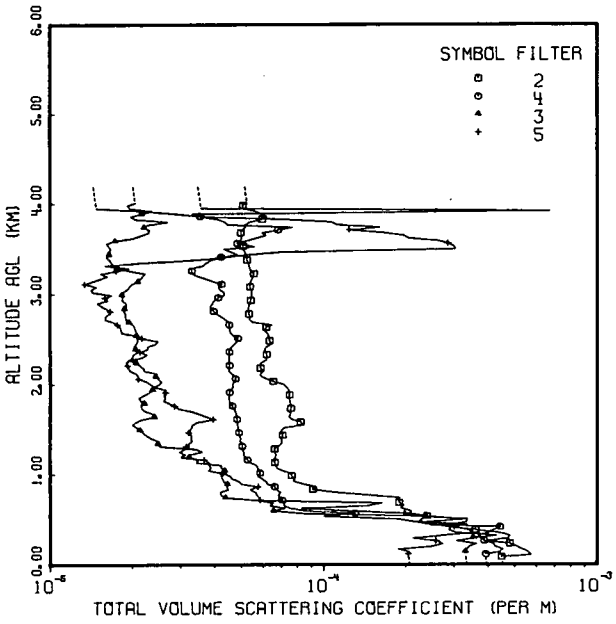
Deelen, 26 kilometers northeast of the track center, recorded 4/8 cumulus with bases from 60 to 900 meters (200 to 3000 feet) and 6/8 to 7/8 thin cirrus at 6000 meters (20,000 feet). Visibility of 4.7 kilometers in fog improved to 10 to 15 kilometers.

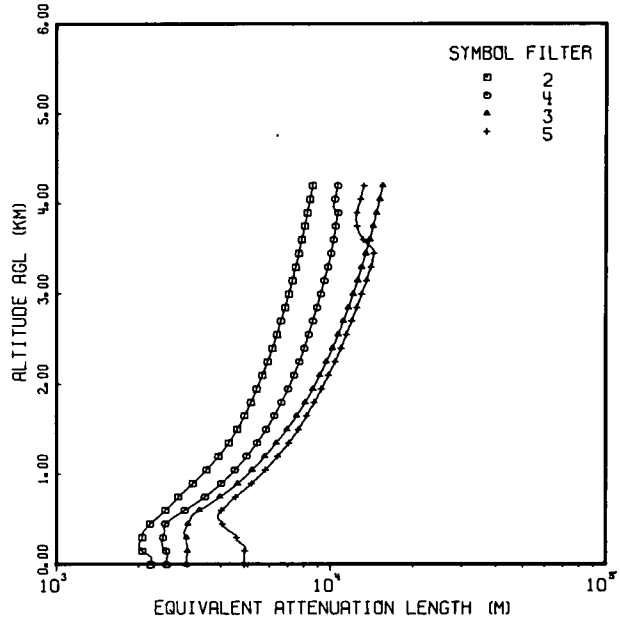
The radiosonde station at DeBilt was northwest and downstream from the track. Vertical cross section data were not available for the area.

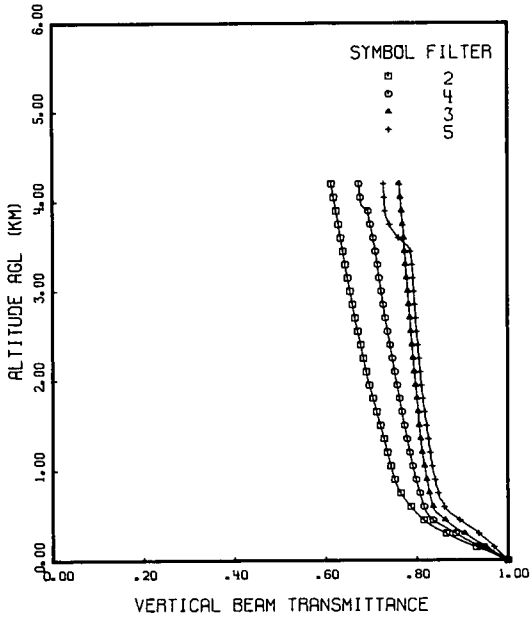
Synoptic Remarks. The surface chart showed an occlusion that extended southsoutheast from a low south of Iceland to Dundee, Cardiff, then as a warm front from Cardiff to Perigueux. The cold front part of this system extended from Cardiff to Brest and southwest into the Atlantic. There was southwesterly flow over the flight track at the surface in the pre-warm frontal conditions. At 500 millibars there was slight ridging from France to Norway with northwesterly flow at this level. The air mass was stable maritime polar.

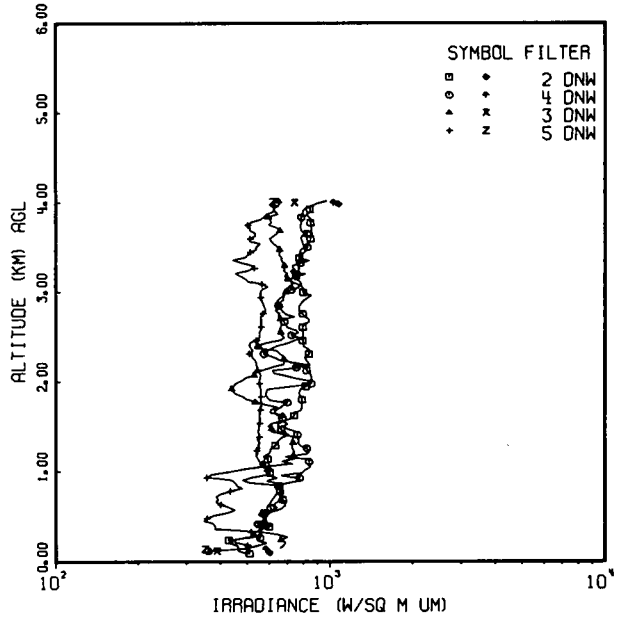
FLIGHT NO. C-450A

SOESTERBERG









FLIGHT NO. C-450A
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6641 DATE 03/29/79)
DATE 32278 FLIGHT NO. C-450A GROUND LEVEL ALTITUDE (M)= 6

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(4.52E-04)	(3.96E-04)	(3.35E-04)	(2.07E-04)
30	(4.50E-04)	(3.94E-04)	(3.33E-04)	(2.06E-04)
60	(4.49E-04)	(3.93E-04)	(3.32E-04)	(2.05E-04)
90	4.48E-04	(3.92E-04)	(3.31E-04)	(2.05E-04)
120	5.73E-04	3.91E-04	(3.31E-04)	2.04E-04
150	5.58E-04	4.41E-04	3.30E-04	2.06E-04
180	5.32E-04	4.52E-04	3.34E-04	1.87E-04
210	5.08E-04	4.22E-04	3.40E-04	2.48E-04
240	4.80E-04	4.19E-04	3.62E-04	2.73E-04
270	3.93E-04	3.85E-04	3.06E-04	2.58E-04
300	4.73E-04	3.76E-04	3.52E-04	2.11E-04
330	4.79E-04	3.68E-04	4.27E-04	2.69E-04
360	4.33E-04	4.00E-04	3.04E-04	3.53E-04
390	3.59E-04	4.16E-04	2.86E-04	3.39E-04
420	2.92E-04	4.41E-04	2.93E-04	3.00E-04
450	3.34E-04	2.46E-04	2.53E-04	2.88E-04
480	2.23E-04	2.16E-04	2.39E-04	3.34E-04
510	2.30E-04	1.86E-04	3.25E-04	3.35E-04
540	2.38E-04	1.00E-04	2.34E-04	2.16E-04
570	2.06E-04	1.30E-04	8.59E-05	1.98E-04
600	2.09E-04	8.58E-05	6.54E-05	1.22E-04
630	1.91E-04	7.50E-05	7.20E-05	8.31E-05
660	1.97E-04	7.13E-05	6.35E-05	1.46E-04
690	1.89E-04	7.16E-05	6.54E-05	1.63E-04
720	1.88E-04	7.03E-05	5.67E-05	5.86E-05
750	1.90E-04	6.90E-05	4.37E-05	5.78E-05
780	1.43E-04	6.81E-05	4.21E-05	5.69E-05
810	1.09E-04	6.96E-05	4.18E-05	5.65E-05
840	9.12E-05	6.71E-05	4.48E-05	5.37E-05
870	9.38E-05	6.61E-05	4.43E-05	5.75E-05
900	8.38E-05	6.22E-05	4.45E-05	5.00E-05
930	7.73E-05	6.15E-05	4.31E-05	4.90E-05
960	7.83E-05	5.94E-05	4.26E-05	4.60E-05
990	7.63E-05	5.71E-05	4.22E-05	4.55E-05
1020	7.57E-05	5.85E-05	4.19E-05	4.28E-05
1050	7.03E-05	5.82E-05	4.35E-05	3.78E-05
1080	6.73E-05	5.75E-05	4.22E-05	3.87E-05
1110	6.67E-05	5.67E-05	4.21E-05	3.82E-05
1140	6.62E-05	5.39E-05	3.42E-05	3.79E-05
1170	6.55E-05	5.26E-05	3.47E-05	3.66E-05
1200	6.65E-05	5.11E-05	3.22E-05	3.00E-05
1230	6.68E-05	5.11E-05	3.25E-05	3.12E-05
1260	6.62E-05	5.09E-05	3.60E-05	2.96E-05
1290	6.60E-05	5.05E-05	3.41E-05	3.11E-05
1320	6.81E-05	5.03E-05	2.52E-05	3.15E-05
1350	7.01E-05	5.06E-05	2.48E-05	3.22E-05
1380	7.04E-05	4.94E-05	2.48E-05	3.30E-05
1410	6.98E-05	4.97E-05	2.34E-05	3.28E-05
1440	7.07E-05	4.92E-05	2.25E-05	3.28E-05
1470	7.00E-05	4.89E-05	2.19E-05	3.21E-05
1500	7.02E-05	4.87E-05	2.13E-05	3.24E-05

FLIGHT NO. C-450A
TOTAL VOLUME SCATTERING COEFFICIENT

(J09 6641 DATE 03/29/79)
DATE 32278 FLIGHT NO. C-450A GROUND LEVEL ALTITUDE (M)= 6

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	7.23E-05	4.86E-05	2.08E-05	3.30E-05
1560	8.46E-05	4.84E-05	2.00E-05	3.32E-05
1590	8.24E-05	4.84E-05	2.06E-05	3.46E-05
1620	7.66E-05	4.82E-05	2.16E-05	3.95E-05
1650	7.48E-05	4.80E-05	2.41E-05	3.73E-05
1680	7.55E-05	4.80E-05	2.41E-05	3.51E-05
1710	7.54E-05	4.76E-05	2.23E-05	3.27E-05
1740	7.58E-05	4.69E-05	2.17E-05	2.94E-05
1770	7.63E-05	4.63E-05	2.15E-05	2.85E-05
1800	7.54E-05	4.53E-05	2.21E-05	2.71E-05
1830	7.52E-05	4.52E-05	2.14E-05	2.60E-05
1860	7.46E-05	4.52E-05	2.11E-05	2.64E-05
1890	7.50E-05	4.52E-05	2.20E-05	2.60E-05
1920	7.52E-05	4.53E-05	2.30E-05	2.64E-05
1950	7.44E-05	4.59E-05	2.37E-05	2.63E-05
1980	7.31E-05	4.66E-05	2.39E-05	2.40E-05
2010	7.17E-05	4.64E-05	2.51E-05	2.33E-05
2040	6.53E-05	4.70E-05	2.56E-05	2.25E-05
2070	6.18E-05	4.77E-05	2.48E-05	2.10E-05
2100	5.90E-05	4.80E-05	2.44E-05	2.09E-05
2130	5.88E-05	4.61E-05	2.47E-05	2.07E-05
2160	6.02E-05	4.51E-05	2.21E-05	1.96E-05
2190	5.88E-05	4.53E-05	2.20E-05	1.94E-05
2220	5.89E-05	4.53E-05	2.13E-05	1.92E-05
2250	5.90E-05	4.51E-05	2.06E-05	1.89E-05
2280	6.15E-05	4.53E-05	1.95E-05	1.94E-05
2310	6.20E-05	4.53E-05	2.00E-05	2.17E-05
2340	6.19E-05	4.53E-05	2.01E-05	2.27E-05
2370	6.14E-05	4.53E-05	2.09E-05	2.14E-05
2400	6.08E-05	4.52E-05	2.06E-05	2.27E-05
2430	6.20E-05	4.63E-05	2.02E-05	2.28E-05
2460	6.47E-05	4.73E-05	2.07E-05	2.43E-05
2490	6.35E-05	4.84E-05	2.09E-05	2.48E-05
2520	6.34E-05	4.87E-05	2.08E-05	2.17E-05
2550	6.30E-05	4.69E-05	2.07E-05	2.08E-05
2580	6.23E-05	4.57E-05	2.06E-05	1.83E-05
2610	6.06E-05	4.54E-05	2.06E-05	1.82E-05
2640	6.17E-05	4.54E-05	2.04E-05	1.81E-05
2670	6.47E-05	4.53E-05	2.02E-05	1.77E-05
2700	5.51E-05	4.51E-05	1.95E-05	1.71E-05
2730	5.35E-05	4.37E-05	1.90E-05	1.59E-05
2760	5.38E-05	4.23E-05	1.89E-05	1.60E-05
2790	5.34E-05	4.07E-05	1.89E-05	1.64E-05
2820	5.32E-05	3.97E-05	1.87E-05	1.66E-05
2850	5.30E-05	3.87E-05	1.88E-05	1.60E-05
2880	5.35E-05	3.88E-05	1.90E-05	1.54E-05
2910	5.39E-05	3.93E-05	1.90E-05	1.49E-05
2940	5.43E-05	3.99E-05	1.84E-05	1.63E-05
2970	5.46E-05	4.13E-05	1.85E-05	1.59E-05
3000	5.48E-05	4.35E-05	1.84E-05	1.69E-05

FLIGHT NO. C-450A
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6641 DATE 03/29/79)
DATE 32278 FLIGHT NO. C-450A GROUND LEVEL ALTITUDE (M)= 6

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	5.48E-05	4.33E-05	1.85E-05	1.43E-05
3060	5.44E-05	4.17E-05	1.92E-05	1.42E-05
3090	5.40E-05	4.16E-05	1.95E-05	1.48E-05
3120	5.42E-05	4.25E-05	1.99E-05	1.34E-05
3150	5.42E-05	3.95E-05	2.10E-05	1.43E-05
3180	5.48E-05	3.73E-05	2.14E-05	1.53E-05
3210	5.54E-05	3.46E-05	2.18E-05	1.63E-05
3240	5.57E-05	3.30E-05	2.23E-05	1.53E-05
3270	5.43E-05	3.30E-05	1.96E-05	1.75E-05
3300	5.38E-05	3.31E-05	1.77E-05	1.95E-05
3330	5.35E-05	3.64E-05	1.72E-05	1.59E-05
3360	5.32E-05	3.74E-05	1.67E-05	2.11E-05
3390	5.26E-05	3.69E-05	1.65E-05	3.28E-05
3420	5.23E-05	4.23E-05	1.61E-05	4.26E-05
3450	5.21E-05	4.85E-05	1.65E-05	5.25E-05
3480	5.17E-05	4.59E-05	1.64E-05	6.99E-05
3510	5.08E-05	4.33E-05	1.67E-05	3.05E-04
3540	5.09E-05	5.61E-05	1.64E-05	3.01E-04
3570	5.09E-05	4.85E-05	1.61E-05	2.85E-04
3600	4.96E-05	5.20E-05	1.73E-05	2.60E-04
3630	5.03E-05	5.65E-05	2.02E-05	2.03E-04
3660	5.03E-05	6.18E-05	2.16E-05	1.96E-04
3690	4.99E-05	5.97E-05	2.29E-05	1.65E-04
3720	5.08E-05	6.84E-05	2.32E-05	1.24E-04
3750	5.17E-05	7.71E-05	2.21E-05	1.60E-04
3780	5.16E-05	4.45E-05	2.29E-05	1.11E-04
3810	5.38E-05	4.36E-05	2.70E-05	1.06E-04
3840	5.98E-05	4.08E-05	2.05E-05	7.11E-05
3870	6.22E-05	3.54E-05	1.97E-05	3.60E-05
3900	5.91E-05	3.31E-05	2.17E-05	2.89E-05
3930	5.61E-05	6.75E-04	2.36E-05	2.18E-05
3960	5.06E-05	3.57E-05	1.96E-05	1.48E-05
3990	5.08E-05	(3.56E-05)	1.92E-05	(1.47E-05)
4020	5.26E-05	(3.55E-05)	2.05E-05	(1.47E-05)
4050	(5.24E-05)	(3.54E-05)	(2.04E-05)	(1.47E-05)
4080	(5.22E-05)	(3.53E-05)	(2.04E-05)	(1.46E-05)
4110	(5.21E-05)	(3.52E-05)	(2.03E-05)	(1.46E-05)
4140	(5.19E-05)	(3.51E-05)	(2.03E-05)	(1.45E-05)
4170	(5.18E-05)	(3.49E-05)	(2.02E-05)	(1.45E-05)
4200	(5.16E-05)	(3.48E-05)	(2.01E-05)	(1.44E-05)
FIRST DATA ALT	90	120	150	120
LAST DATA ALT	4020	3960	4020	3960

FLIGHT NO. C-450A
EQUIVALENT ATTENUATION LENGTH

(JOB 6641 DATE 03/29/79)
DATE 32278 FLIGHT NO. C-450A GROUND LEVEL ALTITUDE (M)= 6

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(2.21E 03)	(2.53E 03)	(2.99E 03)	(4.93E 03)
300	2.06E 03	2.45E 03	2.99E 03	4.54E 03
600	2.50E 03	2.94E 03	3.33E 03	4.00E 03
900	3.15E 03	3.99E 03	4.59E 03	5.15E 03
1200	3.91E 03	4.95E 03	5.77E 03	6.42E 03
1500	4.57E 03	5.83E 03	6.94E 03	7.63E 03
1800	5.13E 03	6.62E 03	8.08E 03	8.72E 03
2100	5.64E 03	7.35E 03	9.14E 03	9.82E 03
2400	6.15E 03	8.02E 03	1.02E 04	1.09E 04
2700	6.60E 03	8.62E 03	1.11E 04	1.19E 04
3000	7.06E 03	9.22E 03	1.21E 04	1.30E 04
3300	7.47E 03	9.79E 03	1.30E 04	1.40E 04
3600	7.87E 03	1.03E 04	1.39E 04	1.32E 04
3900	8.24E 03	1.07E 04	1.47E 04	1.25E 04
4200	(8.59E 03)	(1.06E 04)	(1.55E 04)	(1.32E 04)

FLIGHT NO. C-450A
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	8.65E-01	8.85E-01	9.05E-01	9.36E-01
600	7.87E-01	8.15E-01	8.35E-01	8.61E-01
900	7.51E-01	7.98E-01	8.22E-01	8.40E-01
1200	7.35E-01	7.85E-01	8.12E-01	8.29E-01
1500	7.20E-01	7.73E-01	8.06E-01	8.22E-01
1800	7.04E-01	7.62E-01	8.00E-01	8.13E-01
2100	6.89E-01	7.52E-01	7.95E-01	8.07E-01
2400	6.77E-01	7.41E-01	7.90E-01	8.03E-01
2700	6.64E-01	7.31E-01	7.85E-01	7.98E-01
3000	6.54E-01	7.22E-01	7.80E-01	7.94E-01
3300	6.43E-01	7.14E-01	7.76E-01	7.90E-01
3600	6.33E-01	7.05E-01	7.72E-01	7.61E-01
3900	6.23E-01	6.93E-01	7.67E-01	7.31E-01
4200	(6.13E-01)	(6.73E-01)	(7.62E-01)	(7.28E-01)

FLIGHT C-450B - 22 MARCH 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	1100	1136	0.60	52.2	-	51.4	1080	6
4,5	1140	1227	0.78	51.3	51.3	52.1	1140	6

Flight Description. Flight C-450B was the second third of a triple mission. It was a continuation of a morning flight with data taking commencing about 1100 GMT and ending about 1244. There were multiple layers of scattered to broken clouds with broken cirrus at the highest level. The overall effect was overcast at low altitude. The approximate east to west Soesterberg track was located between Deelen and DeBilt in central Netherlands. Typical terrain features were green fields interspersed with occasional brown fields and small towns.

In-Flight Notes. The in-flight observer noted that an approaching frontal system was moving mid level clouds into the area rapidly and would bring rain in a few hours. Over the area there were scattered cumulus at 460 meters (1500 feet), broken altostratus at 4000 meters (13,000 feet), and broken cirrus at 7600 meters (25,000 feet). There was moderate haze to 460 meters (1500 feet) and light haze to 2100 meters (7000 feet). Slant visibility was 9.6 kilometers (6 miles). At 1005 GMT cumulus bases were at 520 meters (1700 feet) and tops at 940 meters (3100 feet), slant visibility was 24 kilometers (15 miles). At 1100 GMT the flight was occasionally over a large cumulus cell and the cumulus coverage increased by 1125 GMT. By 1210 GMT there was increasing density in the altostratus layer overhead and the cumulus field was being suppressed in the heavier shadow. Slant range visibility decreased to 11 kilometers (7 miles) by 1210 GMT.

Local Weather Notes. DeBilt, 32 kilometers northwest of the track center, reported 2/8 to 3/8 cumulus at 450 to 600 meters (1500 to 2000 feet), 3/8 to 4/8 altocumulus at 3000 meters (10,000 feet), and 6/8 to 7/8 cirrus at 6000 meters (20,000 feet). Visibility of 5 kilometers in fog improved to 7 to 10 kilometers in haze.

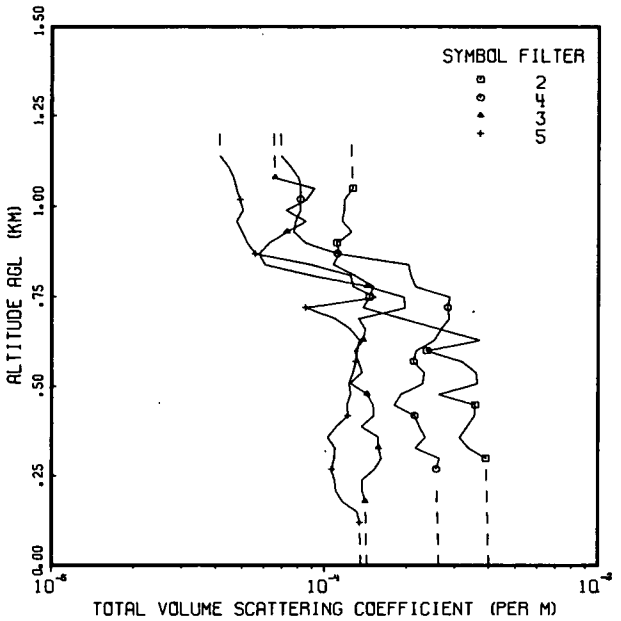
Soesterberg, 30 kilometers northwest of the track center, reported 2/8 to 5/8 cumulus varying in altitude from 360 to 600 meters (1200 to 2000 feet), 4/8 to 6/8 altocumulus at 3000 meters (10,000 feet), and 7/8 cirrus at 6000 meters (20,000 feet). Visibility was 11.2 to 16 kilometers.

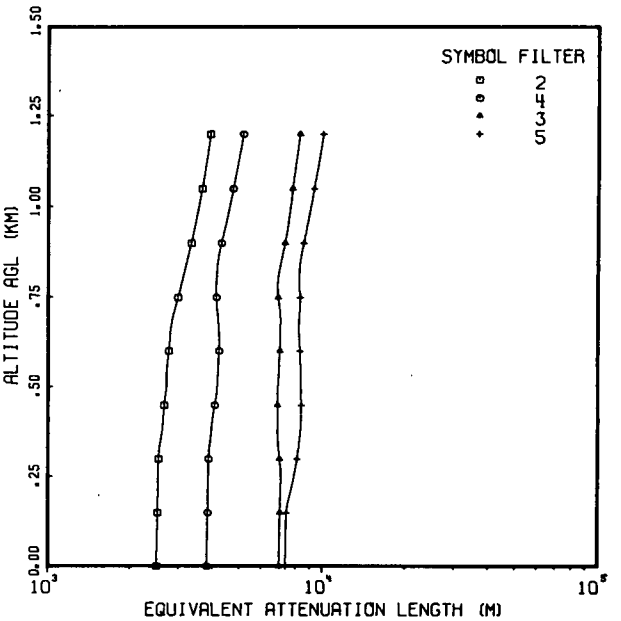
Deelen, 26 kilometers northeast of the track center, recorded 4/8 cumulus with bases from 60 to 900 meters (200 to 3000 feet) and 6/8 to 7/8 thin cirrus at 6000 meters (20,000 feet). Visibility of 4.7 kilometers in fog improved to 10 to 15 kilometers.

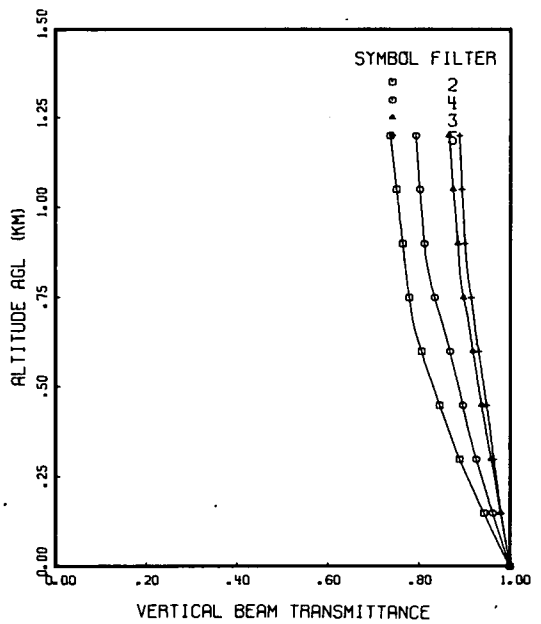
The radiosonde station at DeBilt was northwest and downstream from the track. Vertical cross section data were not available for the area.

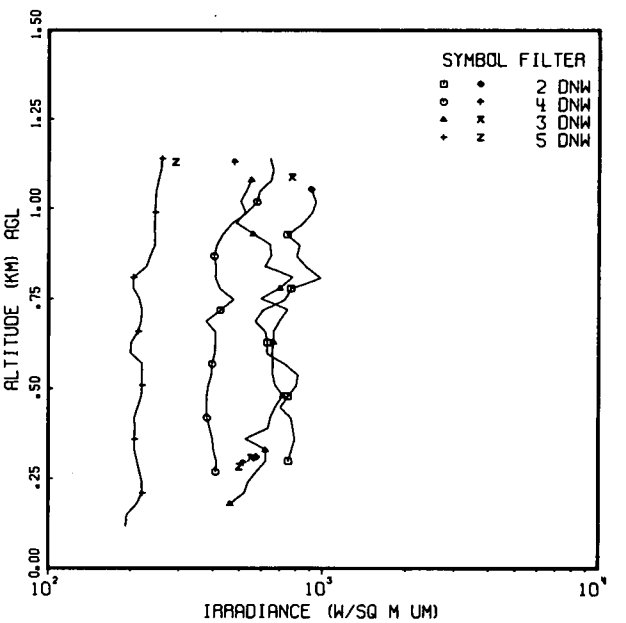
Synoptic Remarks. The surface chart showed an occlusion that extended southsoutheast from a low south of Iceland to Dundee, Cardiff, then as a warm front from Cardiff to Perigueux. The cold front part of this system extended from Cardiff to Brest and southwest into the Atlantic. There was southwesterly flow over the flight track at the surface in the pre-warm frontal conditions. At 500 millibars there was slight ridging from France to Norway with northwesterly flow at this level. The air mass was stable maritime polar.

FLIGHT NO. C-450B
SOESTERBERG









FLIGHT NO. C-450B
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6646 DATE 03/29/79)
DATE 32278 FLIGHT NO. C-450B GROUND LEVEL ALTITUDE (M)= 6

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(4.00E-04)	(2.63E-04)	(1.44E-04)	(1.36E-04)
30	(3.98E-04)	(2.61E-04)	(1.43E-04)	(1.35E-04)
60	(3.97E-04)	(2.61E-04)	(1.42E-04)	(1.35E-04)
90	(3.96E-04)	(2.60E-04)	(1.42E-04)	(1.35E-04)
120	(3.95E-04)	(2.59E-04)	(1.42E-04)	1.34E-04
150	(3.94E-04)	(2.59E-04)	(1.41E-04)	1.32E-04
180	(3.93E-04)	(2.58E-04)	1.41E-04	1.16E-04
210	(3.92E-04)	(2.58E-04)	1.37E-04	1.10E-04
240	(3.91E-04)	(2.57E-04)	1.37E-04	1.09E-04
270	(3.90E-04)	2.56E-04	1.52E-04	1.06E-04
300	3.89E-04	2.63E-04	1.61E-04	1.08E-04
330	3.36E-04	2.15E-04	1.57E-04	1.09E-04
360	3.11E-04	2.33E-04	1.57E-04	1.03E-04
390	3.32E-04	2.22E-04	1.36E-04	1.10E-04
420	3.53E-04	2.13E-04	1.51E-04	1.22E-04
450	3.55E-04	1.80E-04	1.51E-04	1.21E-04
480	2.61E-04	1.90E-04	1.43E-04	1.24E-04
510	3.62E-04	2.29E-04	1.24E-04	1.23E-04
540	3.58E-04	2.31E-04	1.37E-04	1.27E-04
570	3.17E-04	2.11E-04	1.33E-04	1.30E-04
600	2.36E-04	2.16E-04	1.29E-04	1.32E-04
630	3.70E-04	2.52E-04	1.38E-04	1.34E-04
660	2.64E-04	2.66E-04	1.41E-04	1.24E-04
690	1.91E-04	2.65E-04	1.33E-04	1.09E-04
720	1.38E-04	2.82E-04	1.97E-04	8.51E-05
750	1.45E-04	2.87E-04	1.95E-04	1.54E-04
780	1.51E-04	2.14E-04	1.43E-04	1.27E-04
810	1.29E-04	2.06E-04	8.91E-05	1.24E-04
840	1.07E-04	2.02E-04	6.03E-05	8.90E-05
870	1.12E-04	1.11E-04	5.75E-05	5.56E-05
900	1.11E-04	6.50E-05	6.26E-05	5.20E-05
930	1.25E-04	7.69E-05	7.26E-05	4.98E-05
960	1.16E-04	7.80E-05	8.51E-05	4.75E-05
990	1.18E-04	8.13E-05	7.22E-05	5.01E-05
1020	1.18E-04	8.13E-05	6.57E-05	4.89E-05
1050	1.28E-04	8.15E-05	9.14E-05	4.74E-05
1080	(1.26E-04)	8.00E-05	6.57E-05	4.64E-05
1110	(1.25E-04)	7.50E-05	(6.55E-05)	4.44E-05
1140	(1.25E-04)	6.93E-05	(6.54E-05)	4.14E-05
1170	(1.25E-04)	(6.91E-05)	(6.51E-05)	(4.12E-05)
1200	(1.24E-04)	(6.89E-05)	(6.49E-05)	(4.11E-05)
FIRST DATA ALT	300	270	180	120
LAST DATA ALT	1050	1140	1080	1140

FLIGHT NO. C-450B
EQUIVALENT ATTENUATION LENGTH

(JOB 6646 DATE 03/29/79)
DATE 32278 FLIGHT NO. C-450B GROUND LEVEL ALTITUDE (M)= 6

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(2.50E 03)	(3.81E 03)	(6.97E 03)	(7.35E 03)
300	2.54E 03	3.86E 03	6.99E 03	8.09E 03
600	2.76E 03	4.20E 03	6.98E 03	8.25E 03
900	3.33E 03	4.23E 03	7.29E 03	8.53E 03
1200	(3.91E 03)	(5.14E 03)	(8.25E 03)	(1.00E 04)

FLIGHT NO. C-450B
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	8.69E-01	9.25E-01	9.58E-01	9.64E-01
600	8.05E-01	8.67E-01	9.18E-01	9.30E-01
900	7.63E-01	8.10E-01	8.84E-01	9.00E-01
1200	(7.36E-01)	(7.92E-01)	(8.65E-01)	(8.87E-01)

FLIGHT C-451 - 22 MARCH 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2	1308	1325	0.28	55.7	-	57.0	4560	18
3	1327	1344	0.28	57.2	-	58.7	4560	18
4	1343	1401	0.30	58.6	-	60.3	4590	18
5	1402	1418	0.27	60.4	-	62.1	4590	18

Flight Description. Flight C-451 was the last third of this day's triple mission. It was an afternoon flight, data tape commencing near 1247 GMT and landing at 1440 GMT. There were broken low clouds, scattered high thin clouds and multiple haze layers. The approximate northeast to southwest Meppen track was located between Oldenburg and Lathen in northwestern Germany. Typical terrain features were green and brown fields interspersed with occasional dark woods and small towns.

In-Flight Notes. The in-flight observer noted scattered variable broken cumulus clouds with bases at 1100 meters (3500 feet), scattered cirrus clouds at 7600 meters (25,000 feet) and slant visibility 16 kilometers (10 miles). Cumulus tops were 1800 to 2100 meters (6000 to 7000 feet) and thin haze was still visible above the cloud tops. Multiple layers of light haze were present that were blue in color.

Local Weather Notes. Bergen, 149 kilometers east of the track center, reported 7/8 cumulus and stratocumulus at 1500 meters (5000 feet) decreasing to 5/8 and ceilings lowering to 750 meters (2500 feet) after 1300 GMT. Visibility was 20 to 25 kilometers.

Münster, 115 kilometers south of the track center, observed 5/8 to 6/8 cumulus at 630 to 900 meters (2100 to 3000 feet) and 6/8 cirrus at 6000 meters (20,000 feet). Visibility was 20 to 25 kilometers.

Osnabrück, 89 kilometers southeast of the track center, reported 5/8 to 6/8 cumulus at 780 meters (2600 feet) and 5/8 to 6/8 thin cirrus at 6000 meters (20,000 feet). Visibility was 20 to 30 kilometers.

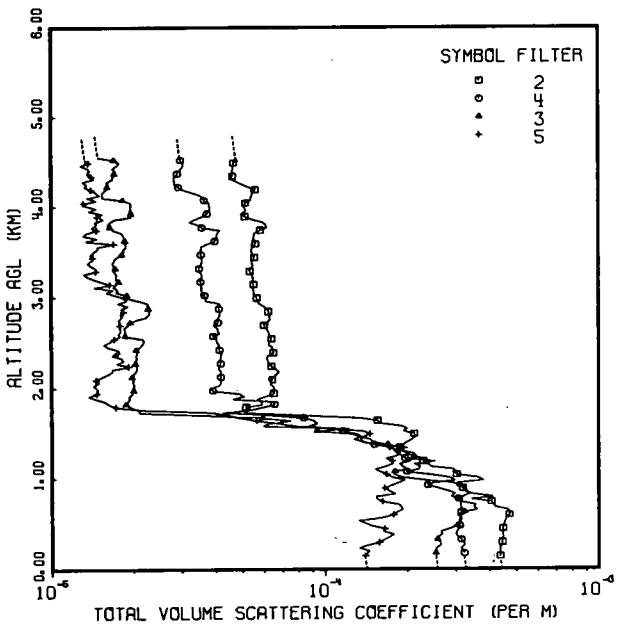
Emden, 46 kilometers northwest of the track center, recorded 4/8 to 7/8 cumulus at 450 to 640 meters (1500 to 1800 feet) and 5/8 thin broken cirrus at 6000 meters (20,000 feet). Visibility was 10 to 15 kilometers.

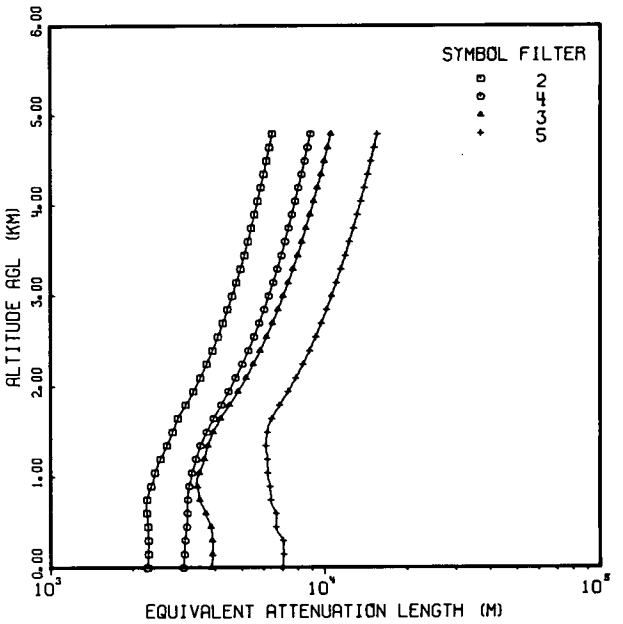
The radiosonde station near Bergen was downstream from the track for low levels. Vertical cross section data were not available for the appropriate area.

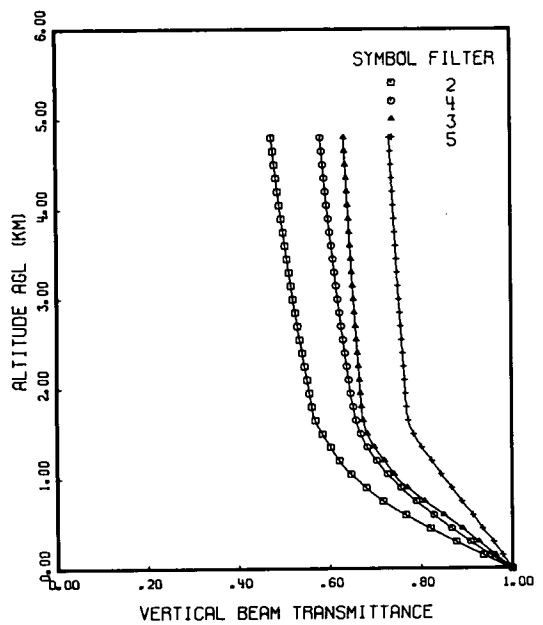
Synoptic Remarks. The surface chart showed an occlusion that extended southsoutheast from a low south of Iceland to Dundee and Cardiff then as a warm front from Cardiff to Perigueux. The cold front part of this system extended from Cardiff to Brest and southwest into the Atlantic. There was southwesterly flow over the flight track at the surface in the pre-warm frontal conditions. At 500 millibars there was slight ridging from France to Norway with northwesterly flow at this level. The air mass was stable maritime polar.

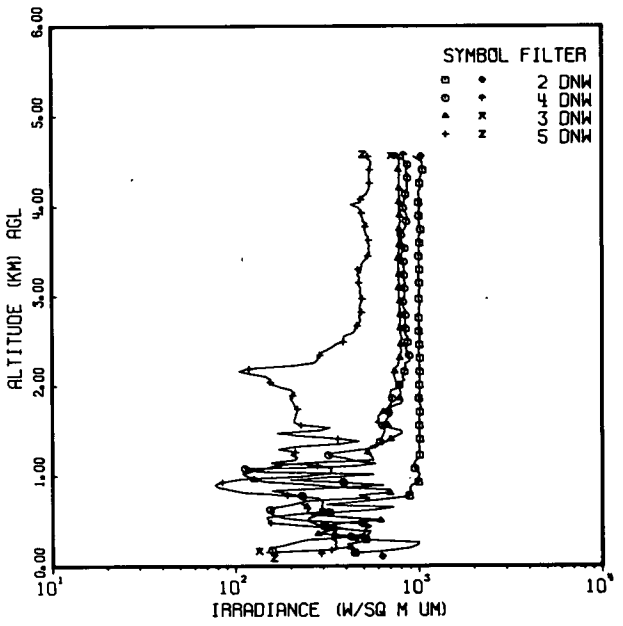
FLIGHT NO. C-451

MEPPEN









FLIGHT NO. C-451
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6654 DATE 03/29/79)
DATE 32278 FLIGHT NO. C-451 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(4.43E-04)	(3.28E-04)	(2.59E-04)	(1.42E-04)
30	(4.41E-04)	(3.26E-04)	(2.57E-04)	(1.42E-04)
60	(4.39E-04)	(3.25E-04)	(2.57E-04)	(1.41E-04)
90	(4.38E-04)	(3.25E-04)	(2.56E-04)	(1.41E-04)
120	(4.37E-04)	(3.24E-04)	(2.55E-04)	(1.41E-04)
150	4.36E-04	(3.23E-04)	(2.55E-04)	1.40E-04
180	4.40E-04	3.22E-04	2.54E-04	1.42E-04
210	4.37E-04	3.21E-04	2.55E-04	1.45E-04
240	4.35E-04	3.13E-04	2.55E-04	1.33E-04
270	4.40E-04	3.23E-04	2.65E-04	1.42E-04
300	4.44E-04	3.22E-04	2.63E-04	1.58E-04
330	4.42E-04	3.15E-04	2.58E-04	1.64E-04
360	4.48E-04	3.07E-04	2.60E-04	1.72E-04
390	4.45E-04	3.01E-04	2.68E-04	1.79E-04
420	4.47E-04	3.03E-04	2.65E-04	1.63E-04
450	4.47E-04	3.08E-04	2.85E-04	1.66E-04
480	4.51E-04	3.10E-04	3.04E-04	1.48E-04
510	4.52E-04	3.11E-04	3.08E-04	1.40E-04
540	4.56E-04	3.10E-04	3.14E-04	1.33E-04
570	4.60E-04	3.13E-04	3.15E-04	1.61E-04
600	4.72E-04	3.13E-04	3.04E-04	1.78E-04
630	4.77E-04	3.14E-04	3.23E-04	1.83E-04
660	4.64E-04	3.18E-04	3.60E-04	1.92E-04
690	4.17E-04	3.14E-04	3.50E-04	1.89E-04
720	4.11E-04	3.13E-04	3.55E-04	1.86E-04
750	4.05E-04	3.12E-04	3.13E-04	1.62E-04
780	3.43E-04	3.08E-04	3.08E-04	1.55E-04
810	4.10E-04	2.88E-04	3.19E-04	1.55E-04
840	3.40E-04	2.99E-04	3.38E-04	1.81E-04
870	3.20E-04	2.79E-04	3.29E-04	1.72E-04
900	3.19E-04	2.59E-04	3.25E-04	1.65E-04
930	3.04E-04	2.37E-04	3.11E-04	1.75E-04
960	3.06E-04	2.48E-04	2.90E-04	1.86E-04
990	3.80E-04	2.98E-04	2.32E-04	1.96E-04
1020	3.61E-04	2.84E-04	1.92E-04	1.76E-04
1050	3.02E-04	2.45E-04	1.78E-04	1.68E-04
1080	2.93E-04	1.99E-04	1.80E-04	1.60E-04
1110	2.97E-04	2.20E-04	2.00E-04	1.52E-04
1140	2.44E-04	2.23E-04	1.92E-04	1.66E-04
1170	2.38E-04	2.11E-04	1.87E-04	1.77E-04
1200	2.29E-04	2.52E-04	2.05E-04	1.76E-04
1230	2.27E-04	1.96E-04	2.10E-04	1.67E-04
1260	2.06E-04	1.91E-04	2.15E-04	1.84E-04
1290	1.98E-04	1.82E-04	2.08E-04	1.89E-04
1320	1.89E-04	1.79E-04	1.87E-04	1.82E-04
1350	1.87E-04	2.00E-04	1.88E-04	1.73E-04
1380	1.92E-04	1.51E-04	1.69E-04	1.54E-04
1410	1.99E-04	1.39E-04	1.50E-04	1.37E-04
1440	2.07E-04	1.27E-04	1.47E-04	1.35E-04
1470	2.15E-04	1.36E-04	1.33E-04	1.39E-04
1500	2.12E-04	1.30E-04	1.25E-04	1.46E-04

FLIGHT NO. C-451
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6654 DATE 03/29/79)
DATE 32278 FLIGHT NO. C-451 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	1.93E-04	1.16E-04	9.35E-05	1.37E-04
1560	2.00E-04	1.04E-04	1.22E-04	1.08E-04
1590	1.89E-04	8.75E-05	5.94E-05	7.77E-05
1620	1.58E-04	9.37E-05	6.28E-05	6.71E-05
1650	1.55E-04	9.09E-05	7.48E-05	5.65E-05
1680	1.34E-04	8.35E-05	5.93E-05	4.85E-05
1710	8.23E-05	6.31E-05	3.79E-05	4.47E-05
1740	5.09E-05	4.26E-05	2.11E-05	3.87E-05
1770	5.18E-05	5.36E-05	2.07E-05	2.17E-05
1800	5.15E-05	5.95E-05	1.95E-05	1.72E-05
1830	5.87E-05	6.54E-05	1.87E-05	1.62E-05
1860	5.90E-05	6.54E-05	1.90E-05	1.58E-05
1890	5.65E-05	4.62E-05	1.93E-05	1.46E-05
1920	6.10E-05	5.07E-05	1.92E-05	1.36E-05
1950	6.50E-05	4.83E-05	1.98E-05	1.46E-05
1980	6.51E-05	3.88E-05	2.00E-05	1.48E-05
2010	6.53E-05	3.84E-05	1.99E-05	1.46E-05
2040	6.41E-05	4.11E-05	2.01E-05	1.42E-05
2070	6.17E-05	4.16E-05	1.99E-05	1.49E-05
2100	6.40E-05	4.16E-05	1.99E-05	1.45E-05
2130	6.49E-05	4.17E-05	1.97E-05	1.52E-05
2160	6.62E-05	4.16E-05	1.99E-05	1.60E-05
2190	6.80E-05	4.18E-05	2.03E-05	1.67E-05
2220	6.61E-05	4.11E-05	2.06E-05	1.68E-05
2250	6.37E-05	4.11E-05	2.05E-05	1.92E-05
2280	6.21E-05	4.16E-05	2.03E-05	1.74E-05
2310	6.17E-05	4.16E-05	2.02E-05	1.84E-05
2340	6.14E-05	4.16E-05	2.06E-05	1.80E-05
2370	6.21E-05	4.19E-05	2.03E-05	1.66E-05
2400	6.49E-05	4.21E-05	2.07E-05	1.74E-05
2430	6.48E-05	4.12E-05	2.04E-05	1.77E-05
2460	6.42E-05	4.10E-05	2.10E-05	1.61E-05
2490	6.21E-05	4.10E-05	2.15E-05	1.56E-05
2520	6.29E-05	4.03E-05	2.18E-05	1.63E-05
2550	6.37E-05	4.02E-05	2.17E-05	1.70E-05
2580	6.28E-05	3.91E-05	1.86E-05	1.78E-05
2610	6.24E-05	4.11E-05	1.86E-05	1.76E-05
2640	6.18E-05	4.06E-05	1.86E-05	1.80E-05
2670	6.08E-05	4.04E-05	1.84E-05	1.78E-05
2700	5.99E-05	3.91E-05	1.90E-05	1.79E-05
2730	6.13E-05	4.07E-05	1.94E-05	1.78E-05
2760	6.29E-05	4.07E-05	2.03E-05	1.76E-05
2790	6.26E-05	4.11E-05	2.22E-05	1.82E-05
2820	6.24E-05	4.14E-05	2.28E-05	1.79E-05
2850	6.22E-05	4.11E-05	2.29E-05	1.84E-05
2880	6.20E-05	4.09E-05	2.26E-05	1.80E-05
2910	5.97E-05	4.12E-05	2.25E-05	1.91E-05
2940	5.74E-05	4.12E-05	2.26E-05	1.75E-05
2970	5.71E-05	3.66E-05	2.08E-05	1.88E-05
3000	5.63E-05	3.67E-05	1.90E-05	1.87E-05

FLIGHT NO. C-451
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6654 DATE 03/29/79)
DATE 32278 FLIGHT NO. C-451 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	5.56E-05	3.63E-05	1.89E-05	1.73E-05
3060	5.49E-05	3.56E-05	1.73E-05	1.59E-05
3090	5.48E-05	3.54E-05	1.76E-05	1.68E-05
3120	5.49E-05	3.54E-05	1.68E-05	1.44E-05
3150	5.48E-05	3.54E-05	1.72E-05	1.64E-05
3180	5.48E-05	3.51E-05	1.76E-05	1.53E-05
3210	5.45E-05	3.50E-05	1.72E-05	1.43E-05
3240	5.46E-05	3.55E-05	1.73E-05	1.36E-05
3270	5.40E-05	3.53E-05	1.74E-05	1.31E-05
3300	5.32E-05	3.48E-05	1.69E-05	1.46E-05
3330	5.38E-05	3.47E-05	1.71E-05	1.45E-05
3360	5.46E-05	3.51E-05	1.69E-05	1.40E-05
3390	5.41E-05	3.55E-05	1.67E-05	1.36E-05
3420	5.42E-05	3.55E-05	1.70E-05	1.40E-05
3450	5.53E-05	3.56E-05	1.73E-05	1.42E-05
3480	5.50E-05	3.53E-05	1.81E-05	1.39E-05
3510	5.41E-05	3.56E-05	1.85E-05	1.43E-05
3540	5.39E-05	3.53E-05	1.83E-05	1.48E-05
3570	5.49E-05	3.54E-05	1.88E-05	1.48E-05
3600	5.58E-05	3.73E-05	1.87E-05	1.70E-05
3630	5.56E-05	3.97E-05	1.86E-05	1.34E-05
3660	5.49E-05	4.04E-05	1.85E-05	1.47E-05
3690	5.53E-05	4.03E-05	1.83E-05	1.31E-05
3720	5.55E-05	4.07E-05	1.81E-05	1.35E-05
3750	5.82E-05	4.15E-05	1.69E-05	1.47E-05
3780	6.13E-05	3.56E-05	1.64E-05	1.41E-05
3810	6.08E-05	3.44E-05	1.61E-05	1.46E-05
3840	5.95E-05	3.21E-05	1.65E-05	1.44E-05
3870	5.41E-05	3.35E-05	1.70E-05	1.56E-05
3900	5.11E-05	3.56E-05	1.96E-05	1.48E-05
3930	4.94E-05	3.72E-05	1.96E-05	1.54E-05
3960	5.14E-05	3.78E-05	1.93E-05	1.37E-05
3990	5.11E-05	3.81E-05	1.96E-05	1.46E-05
4020	5.03E-05	3.79E-05	1.95E-05	1.34E-05
4050	5.13E-05	3.80E-05	1.96E-05	1.31E-05
4080	5.35E-05	3.63E-05	1.83E-05	1.47E-05
4110	5.38E-05	3.60E-05	1.54E-05	1.36E-05
4140	5.42E-05	3.50E-05	1.54E-05	1.51E-05
4170	5.46E-05	3.26E-05	1.54E-05	1.45E-05
4200	5.58E-05	3.03E-05	1.59E-05	1.40E-05
4230	5.28E-05	2.93E-05	1.60E-05	1.33E-05
4260	4.99E-05	2.82E-05	1.62E-05	1.35E-05
4290	4.76E-05	2.83E-05	1.59E-05	1.29E-05
4320	4.55E-05	2.81E-05	1.68E-05	1.43E-05
4350	4.61E-05	2.83E-05	1.69E-05	1.40E-05
4380	4.63E-05	2.89E-05	1.70E-05	1.35E-05
4410	4.61E-05	2.95E-05	1.72E-05	1.38E-05
4440	4.64E-05	2.99E-05	1.67E-05	1.36E-05
4470	4.65E-05	3.05E-05	1.74E-05	1.28E-05
4500	4.66E-05	3.03E-05	1.78E-05	1.37E-05

FLIGHT NO. C-451
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6654 DATE 03/29/79)
DATE 32278 FLIGHT NO. C-451 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
4530	4.81E-05	2.98E-05	1.70E-05	1.33E-05
4560	4.73E-05	2.96E-05	1.49E-05	(1.32E-05)
4590	(4.72E-05)	2.96E-05	(1.48E-05)	(1.32E-05)
4620	(4.70E-05)	(2.95E-05)	(1.48E-05)	(1.32E-05)
4650	(4.69E-05)	(2.94E-05)	(1.47E-05)	(1.31E-05)
4680	(4.68E-05)	(2.93E-05)	(1.47E-05)	(1.31E-05)
4710	(4.66E-05)	(2.92E-05)	(1.46E-05)	(1.30E-05)
4740	(4.65E-05)	(2.91E-05)	(1.46E-05)	(1.30E-05)
4770	(4.63E-05)	(2.90E-05)	(1.45E-05)	(1.30E-05)
4800	(4.62E-05)	(2.89E-05)	(1.45E-05)	(1.29E-05)
FIRST DATA ALT	150	180	180	150
LAST DATA ALT	4560	4590	4560	4530

FLIGHT NO. C-451
EQUIVALENT ATTENUATION LENGTH

(JOB 6654 DATE 03/29/79)
DATE 32278 FLIGHT NO. C-451 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(2.26E 03)	(3.05E 03)	(3.87E 03)	(7.02E 03)
300	2.28E 03	3.10E 03	3.89E 03	7.06E 03
600	2.25E 03	3.16E 03	3.68E 03	6.64E 03
900	2.33E 03	3.21E 03	3.43E 03	6.31E 03
1200	2.52E 03	3.40E 03	3.65E 03	6.17E 03
1500	2.79E 03	3.71E 03	3.93E 03	6.17E 03
1800	3.12E 03	4.20E 03	4.49E 03	6.83E 03
2100	3.52E 03	4.74E 03	5.16E 03	7.84E 03
2400	3.90E 03	5.26E 03	5.81E 03	8.79E 03
2700	4.26E 03	5.77E 03	6.45E 03	9.70E 03
3000	4.60E 03	6.25E 03	7.05E 03	1.06E 04
3300	4.93E 03	6.72E 03	7.67E 03	1.14E 04
3600	5.25E 03	7.19E 03	8.26E 03	1.23E 04
3900	5.55E 03	7.61E 03	8.84E 03	1.31E 04
4200	5.85E 03	8.02E 03	9.41E 03	1.39E 04
4500	6.14E 03	8.45E 03	9.97E 03	1.47E 04
4800	(6.43E 03)	(8.87E 03)	(1.05E 04)	(1.55E 04)

FLIGHT NO. C-451
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

$T_{R,1} = 0.038$

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	8.77E-01	9.08E-01	9.26E-01	9.58E-01
600	7.66E-01	8.27E-01	8.50E-01	9.14E-01
900	6.80E-01	7.55E-01	7.69E-01	8.67E-01
1200	6.21E-01	7.02E-01	7.20E-01	8.23E-01
1500	5.84E-01	6.68E-01	6.82E-01	7.84E-01
1800	5.61E-01	6.51E-01	6.70E-01	7.68E-01
2100	5.51E-01	6.42E-01	6.66E-01	7.65E-01
2400	5.40E-01	6.34E-01	6.62E-01	7.61E-01
2700	5.30E-01	6.26E-01	6.58E-01	7.57E-01
3000	5.21E-01	6.19E-01	6.54E-01	7.53E-01
3300	5.12E-01	6.12E-01	6.50E-01	7.50E-01
3600	5.04E-01	6.06E-01	6.47E-01	7.46E-01
3900	4.95E-01	5.99E-01	6.43E-01	7.43E-01
4200	4.88E-01	5.92E-01	6.40E-01	7.40E-01
4500	4.81E-01	5.87E-01	6.37E-01	7.37E-01
4800	(4.74E-01)	(5.82E-01)	(6.34E-01)	(7.34E-01)

FLIGHT C-452 - 23 MARCH 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2	1429	1452	0.38	63.0	-	65.8	5220	18
3	1453	1518	0.42	66.0	-	69.1	5220	18
4	1516	1528	0.20	68.9	-	70.5	1140	18
5	1530	1540	0.17	70.7	-	72.1	1020	18

Flight Description. Flight C-452 was an afternoon flight with take off at 1358 and landing at 1608 GMT. There were multiple cloud decks with overcast altostratus and rain and thundershowers. The mission was terminated early due to severe thunderstorm activity and thus the data from the second half is only partially complete. The approximate southeast to southwest Meppen track was located between Oldenburg and Lathen in northwestern Germany. Typical terrain features were green and brown fields interspersed with occasional dark woods and small towns.

In-Flight Notes. The in-flight observer noted that a strong front had passed over the area in the morning hours making this an excellent case of post frontal conditions with strong westerly to northwesterly flow. At 1430 GMT there were scattered cumulus at 1100 meters (3500 feet), scattered altostratus at 2400 meters (8000 feet) and high broken cirrus clouds with light haze. The ascent was in the clear until 3000 meters (10,000 feet) where thin clouds began and continued to 5500 meters (18,000 feet). The downward visibility was generally good. At 1445 GMT there was overcast thin cirrus and lower clouds were visible at unknown heights. At 1530 GMT there was a broken layer at 1100 meters (3500 feet) and overcast at 3000 meters (10,000 feet) with light rain. In addition, a line of thunderstorms was moving east rapidly.

Local Weather Notes. Bergen, 149 kilometers east of the track center, reported 1/8 to 2/8 cumulus at 450 meters (1500 feet), 7/8 stratocumulus at 600-750 meters (2000 to 2500 feet) and visibility 35 kilometers.

Münster, 115 kilometers south of the track center, observed 6/8 cumulus at 390 meters (1300 feet) and 7/8 cirrus at 6000 meters (20,000 feet) at 1400 GMT with visibility 35 kilometers in light rain shower. At 1500 GMT there was a thundershower with 6/8 cumulonimbus at 300 meters (1000 feet), 7/8 altocumulus at 3000 meters (10,000 feet) and 7/8 cirrus at 6000 meters (20,000 feet). Later the clouds decreased to 3/8 cumulonimbus at 450 meters (1500 feet), 4/8 altocumulus at 3000 meters and 6/8 cirrus at 6000 meters.

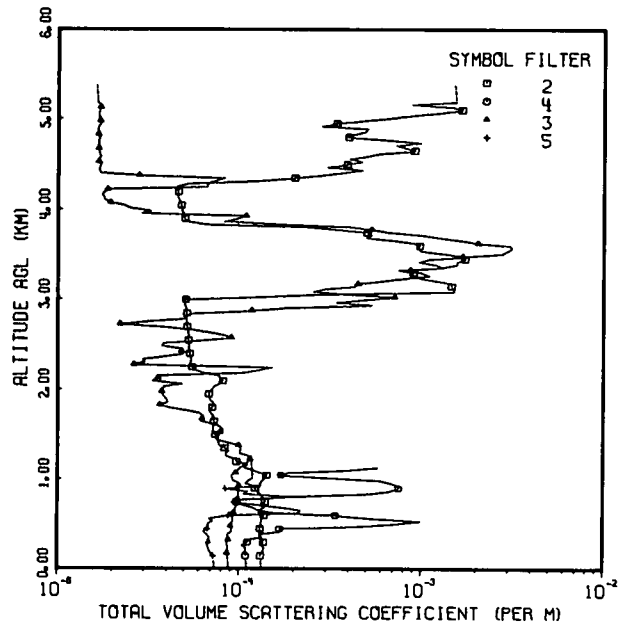
Osnabrück, 89 kilometers southeast of the track center, recorded 7/8 cumulonimbus at 690 meters (2300 feet) with 30 kilometers visibility in a thundershower at 1400 GMT. Conditions improved to 1/8 to 2/8 cumulus at 450 meters (1500 feet) and 7/8 cumulonimbus at 780 meters (2600 feet) with visibility 40 kilometers.

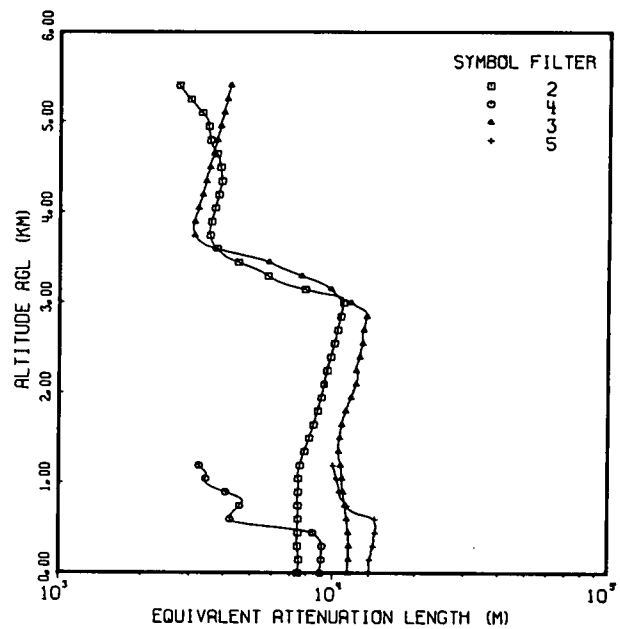
Emden, 46 kilometers northwest of the track center, observed 7/8 fractostratus at 900 meters (3000 feet) and 20 kilometers visibility in light rain at 1400 GMT. By 1500 GMT there was overcast fractostratus at 300 meters (1000 feet) and 8 kilometers visibility in light rain. The clouds lifted to 2/8 fractostratus at 300 meters (1000 feet) and 7/8 fractocumulus at 1200 meters (4000 feet) and visibility 17 kilometers at 1600 GMT.

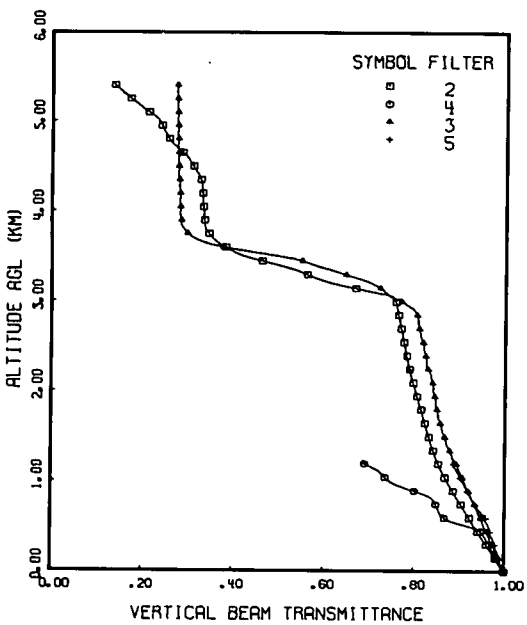
The radiosonde station near Bergen was downstream from the track for levels under 500 millibars where the winds shifted. The vertical cross section for 1200 GMT had 3/8 cloud at 600 meters, 6/8 cover from 1200 to 4400 meters and clear above.

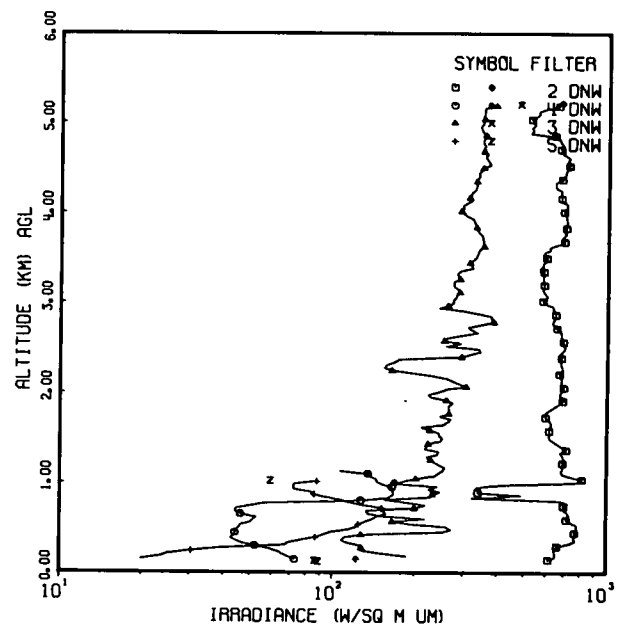
Synoptic Remarks. The surface chart showed that an occlusion from a low in the North Sea was west of Norway and extended south and southwest through Kiel Bay to extreme western Czechoslovakia and northern Italy, then as a cold front with waves through central Spain into the Atlantic. The Meppen track had post cold frontal westerly winds and instability showers. The 500 millibars chart showed ridging from Spain to southern Norway with southwesterly flow at this level. The air mass was unstable maritime polar.

FLIGHT NO. C-452
MEPPEN









FLIGHT NO. C-452
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5261 DATE 04/04/79)
DATE 32678 FLIGHT NO. C-452 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(1.34E-04)	(1.11E-04)	(8.78E-05)	(7.36E-05)
30	(1.33E-04)	(1.10E-04)	(8.74E-05)	(7.32E-05)
60	(1.33E-04)	(1.10E-04)	(8.72E-05)	(7.31E-05)
90	(1.32E-04)	(1.10E-04)	(8.70E-05)	(7.29E-05)
120	(1.32E-04)	(1.09E-04)	(8.68E-05)	(7.27E-05)
150	1.32E-04	1.09E-04	(8.65E-05)	7.25E-05
180	1.36E-04	1.09E-04	8.63E-05	7.03E-05
210	1.36E-04	1.09E-04	8.68E-05	6.86E-05
240	1.38E-04	1.10E-04	8.74E-05	6.79E-05
270	1.34E-04	1.04E-04	8.68E-05	6.77E-05
300	1.37E-04	1.12E-04	8.56E-05	6.79E-05
330	1.35E-04	1.11E-04	8.78E-05	6.90E-05
360	1.33E-04	1.34E-04	8.64E-05	6.85E-05
390	1.31E-04	1.30E-04	8.72E-05	6.68E-05
420	1.32E-04	1.63E-04	9.19E-05	6.38E-05
450	1.31E-04	1.68E-04	9.10E-05	6.73E-05
480	1.35E-04	4.58E-04	9.02E-05	6.80E-05
510	1.32E-04	7.27E-04	9.20E-05	6.76E-05
540	1.33E-04	9.95E-04	9.33E-05	7.22E-05
570	1.33E-04	5.26E-04	9.27E-05	6.84E-05
600	1.38E-04	3.40E-04	9.31E-05	8.79E-05
630	1.29E-04	1.54E-04	9.37E-05	2.12E-04
660	1.31E-04	1.23E-04	9.62E-05	2.18E-04
690	1.36E-04	1.19E-04	9.64E-05	1.72E-04
720	1.33E-04	1.05E-04	9.79E-05	1.26E-04
750	1.40E-04	9.72E-05	9.76E-05	9.41E-05
780	1.41E-04	1.06E-04	9.89E-05	1.06E-04
810	1.34E-04	2.04E-04	1.00E-04	1.98E-04
840	1.30E-04	5.14E-04	9.99E-05	1.07E-04
870	1.26E-04	6.73E-04	1.00E-04	1.12E-04
900	1.23E-04	7.54E-04	1.00E-04	8.47E-05
930	1.31E-04	7.56E-04	1.00E-04	1.21E-04
960	1.31E-04	6.81E-04	1.02E-04	1.08E-04
990	1.35E-04	5.89E-04	9.33E-05	1.15E-04
1020	1.40E-04	3.07E-04	9.21E-05	1.19E-04
1050	1.43E-04	1.71E-04	9.09E-05	(1.19E-04)
1080	1.31E-04	1.88E-04	9.62E-05	(1.19E-04)
1110	1.20E-04	3.95E-04	9.94E-05	(1.18E-04)
1140	1.07E-04	5.79E-04	1.03E-04	(1.18E-04)
1170	1.12E-04	(5.78E-04)	1.09E-04	(1.18E-04)
1200	9.70E-05	(5.76E-04)	1.12E-04	(1.17E-04)
1230	9.63E-05		1.15E-04	
1260	8.50E-05		1.16E-04	
1290	8.48E-05		1.01E-04	
1320	8.82E-05		1.02E-04	
1350	8.31E-05		1.03E-04	
1380	7.30E-05		9.93E-05	
1410	7.71E-05		8.77E-05	
1440	7.62E-05		7.60E-05	
1470	7.49E-05		7.40E-05	
1500	7.36E-05		7.69E-05	

FLIGHT NO. C-452
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5261 DATE 04/04/79)
DATE 32378 FLIGHT NO. C-452 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	7.23E-05		7.90E-05	
1560	7.21E-05		8.22E-05	
1590	7.19E-05		7.81E-05	
1620	7.35E-05		7.27E-05	
1650	7.25E-05		6.13E-05	
1680	7.12E-05		6.23E-05	
1710	7.20E-05		6.34E-05	
1740	6.95E-05		5.98E-05	
1770	6.77E-05		5.04E-05	
1800	7.06E-05		4.10E-05	
1830	7.37E-05		3.64E-05	
1860	7.13E-05		4.02E-05	
1890	6.90E-05		4.00E-05	
1920	6.79E-05		3.87E-05	
1950	6.78E-05		3.76E-05	
1980	6.93E-05		3.74E-05	
2010	7.15E-05		3.83E-05	
2040	7.27E-05		3.85E-05	
2070	7.75E-05		4.83E-05	
2100	8.06E-05		3.32E-05	
2130	7.85E-05		3.56E-05	
2160	7.69E-05		3.74E-05	
2190	6.31E-05		1.06E-04	
2220	5.01E-05		1.29E-04	
2250	5.48E-05		1.51E-04	
2280	5.59E-05		2.62E-05	
2310	5.42E-05		3.01E-05	
2340	5.45E-05		2.93E-05	
2370	5.35E-05		3.75E-05	
2400	5.33E-05		4.90E-05	
2430	5.27E-05		4.33E-05	
2460	5.30E-05		4.77E-05	
2490	5.28E-05		3.76E-05	
2520	5.24E-05		3.87E-05	
2550	5.24E-05		6.16E-05	
2580	5.23E-05		9.04E-05	
2610	5.28E-05		8.16E-05	
2640	5.21E-05		6.77E-05	
2670	5.27E-05		5.37E-05	
2700	5.15E-05		3.79E-05	
2730	5.16E-05		2.21E-05	
2760	5.13E-05		3.12E-05	
2790	5.10E-05		4.97E-05	
2820	5.08E-05		5.07E-05	
2850	5.12E-05		5.68E-05	
2880	5.16E-05		1.17E-04	
2910	5.11E-05		1.77E-04	
2940	5.01E-05		5.33E-04	
2970	4.99E-05		3.42E-04	
3000	5.06E-05		4.84E-04	

FLIGHT NO. C-452
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 5261 DATE 04/04/79)
DATE 32578 FLIGHT NO. C-452 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	1.25E-04		7.10E-04	
3060	2.68E-04		3.98E-04	
3090	1.52E-03		2.57E-04	
3120	1.49E-03		2.94E-04	
3150	1.46E-03		4.30E-04	
3180	1.50E-03		4.47E-04	
3210	1.22E-03		6.07E-04	
3240	9.82E-04		7.98E-04	
3270	8.96E-04		1.10E-03	
3300	8.98E-04		9.86E-04	
3330	7.50E-04		8.69E-04	
3360	1.29E-03		1.29E-03	
3390	1.56E-03		1.19E-03	
3420	1.57E-03		9.68E-04	
3450	1.73E-03		1.10E-03	
3480	1.79E-03		1.68E-03	
3510	1.32E-03		2.77E-03	
3540	9.92E-04		2.96E-03	
3570	9.50E-04		3.14E-03	
3600	9.72E-04		3.08E-03	
3630	9.10E-04		2.04E-03	
3660	7.03E-04		1.65E-03	
3690	4.96E-04		1.25E-03	
3720	5.32E-04		9.93E-04	
3750	4.99E-04		6.59E-04	
3780	3.49E-04		5.32E-04	
3810	2.34E-04		4.04E-04	
3840	6.53E-05		1.75E-04	
3870	5.17E-05		8.31E-05	
3900	4.97E-05		9.56E-05	
3930	4.94E-05		1.08E-04	
3960	4.90E-05		2.88E-05	
3990	4.79E-05		3.22E-05	
4020	4.85E-05		2.50E-05	
4050	4.74E-05		2.31E-05	
4080	4.70E-05		1.95E-05	
4110	4.64E-05		1.81E-05	
4140	4.54E-05		1.81E-05	
4170	4.59E-05		1.74E-05	
4200	4.57E-05		1.82E-05	
4230	4.55E-05		1.87E-05	
4260	4.51E-05		6.63E-05	
4290	5.22E-05		6.56E-05	
4320	1.27E-04		7.38E-05	
4350	2.01E-04		8.20E-05	
4380	2.30E-04		2.79E-05	
4410	3.69E-04		1.72E-05	
4440	4.71E-04		1.68E-05	
4470	3.02E-04		1.70E-05	
4500	3.88E-04		1.72E-05	

FLIGHT NO. C-452
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 2261 DATE 04/04/79)
DATE 32378 FLIGHT NO. C-452 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
4530	4.68E-04		1.67E-05	
4560	4.04E-04		1.70E-05	
4590	4.96E-04		1.73E-05	
4620	5.89E-04		1.69E-05	
4650	9.08E-04		1.67E-05	
4680	8.06E-04		1.67E-05	
4710	7.22E-04		1.68E-05	
4740	9.79E-04		1.68E-05	
4770	6.43E-04		1.68E-05	
4800	3.95E-04		1.70E-05	
4830	4.26E-04		1.66E-05	
4860	4.83E-04		1.66E-05	
4890	5.05E-04		1.67E-05	
4920	2.63E-04		1.68E-05	
4950	3.38E-04		1.72E-05	
4980	4.62E-04		1.70E-05	
5010	6.68E-04		1.70E-05	
5040	8.74E-04		1.69E-05	
5070	1.25E-03		1.69E-05	
5100	1.66E-03		1.70E-05	
5130	1.47E-03		1.71E-05	
5160	8.86E-04		1.70E-05	
5190	1.53E-03		1.65E-05	
5220	(1.53E-03)		(1.64E-05)	
5250	(1.52E-03)		(1.64E-05)	
5280	(1.52E-03)		(1.63E-05)	
5310	(1.51E-03)		(1.63E-05)	
5340	(1.51E-03)		(1.62E-05)	
5370	(1.50E-03)		(1.62E-05)	
5400	(1.50E-03)		(1.61E-05)	
FIRST DATA ALT	150	150	180	150
LAST DATA ALT	5190	1140	5190	1020

FLIGHT NO. C-452
EQUIVALENT ATTENUATION LENGTH

(JOB 5261 DATE 04/04/79)
DATE 32378 FLIGHT NO. C-452 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(7.48E 03)	(9.04E 03)	(1.14E 04)	(1.36E 04)
300	7.46E 03	9.17E 03	1.15E 04	1.41E 04
600	7.48E 03	4.23E 03	1.13E 04	1.43E 04
900	7.49E 03	4.07E 03	1.09E 04	1.96E 04
1200	7.60E 03	(3.26E 03)	1.07E 04	(1.00E 04)
1500	8.21E 03		1.06E 04	
1800	8.81E 03		1.12E 04	
2100	9.39E 03		1.21E 04	
2400	9.83E 03		1.25E 04	
2700	1.04E 04		1.29E 04	
3000	1.09E 04		1.16E 04	
3300	5.76E 03		7.65E 03	
3600	3.75E 03		3.71E 03	
3900	3.58E 03		3.11E 03	
4200	3.60E 03		3.32E 03	
4500	3.65E 03		3.53E 03	
4800	3.53E 03		3.75E 03	
5100	3.29E 03		3.97E 03	
5400	(2.72E 03)		(4.18E 03)	

FLIGHT NO. C-452
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.61E-01	9.63E-01	9.74E-01	9.79E-01
600	9.23E-01	8.68E-01	9.48E-01	9.59E-01
900	8.87E-01	8.01E-01	9.21E-01	9.19E-01
1200	8.54E-01	(6.92E-01)	8.94E-01	(8.87E-01)
1500	8.33E-01		8.68E-01	
1800	8.15E-01		8.51E-01	
2100	7.98E-01		8.41E-01	
2400	7.83E-01		8.25E-01	
2700	7.71E-01		8.11E-01	
3000	7.59E-01		7.72E-01	
3300	5.64E-01		6.50E-01	
3600	3.83E-01		3.79E-01	
3900	3.36E-01		2.86E-01	
4200	3.31E-01		2.83E-01	
4500	3.11E-01		2.79E-01	
4800	2.57E-01		2.78E-01	
5100	2.12E-01		2.76E-01	
5400	(1.37E-01)		(2.75E-01)	

FLIGHT C-453 - 28 MARCH 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2	0841	0856	0.25	61.5	-	59.8	3060	18
3	0858	0916	0.30	59.6	-	57.6	3060	18
4	0918	0931	0.22	57.5	-	56.2	3030	18
5	0933	0952	0.32	56.0	-	54.4	3030	18

Flight Description. Flight C-453 was a morning flight with take off at 0806 and data tape ending about 1000 GMT. There were multiple cloud layers with overcast cirrus at the highest level. The approximate northeast to southwest Meppen track was located between Oldenburg and Lathen in northwestern Germany. Typical terrain features were green and brown fields interspersed with occasional dark woods and small towns.

In-Flight Notes. The in-flight observer reported scattered variable broken clouds at 300 meters (1000 feet) and scattered clouds at 1800 meters (6000 feet) at the east end of the track with overcast at 300 meters (1000 feet), scattered clouds at 1200 meters (4000 feet), scattered variable broken at 1800 meters (6000 feet), and a high overcast at the west end of the track at 1045 GMT. On the ascent there was patchy scud from 300 to 460 meters (1000 to 1500 feet) and the moderate haze was generally distributed below the flight level of 1800 meters (6000 feet). Haze tops were about 1900 meters (6100 feet). On the descent the flight was in the clear at 3000 meters (10,000 feet), tops of broken clouds were 760 meters (2500 feet) and bases 460 meters (1500 feet). On the following ascent cloud coverage was increasing.

Local Weather Notes. Bergen, 149 kilometers east of the track center, reported 1/8 to 5/8 cumulus and stratocumulus with bases 600-750 meters (2000 to 2500 feet), 7/8 cirrus at 7500 meters (25,000 feet) and visibility 15 to 18 kilometers.

Münster, 115 kilometers south of the track center, recorded 6/8 to 8/8 stratocumulus at 900 to 990 meters (3000 to 3300 feet) with visibility 10 to 15 kilometers.

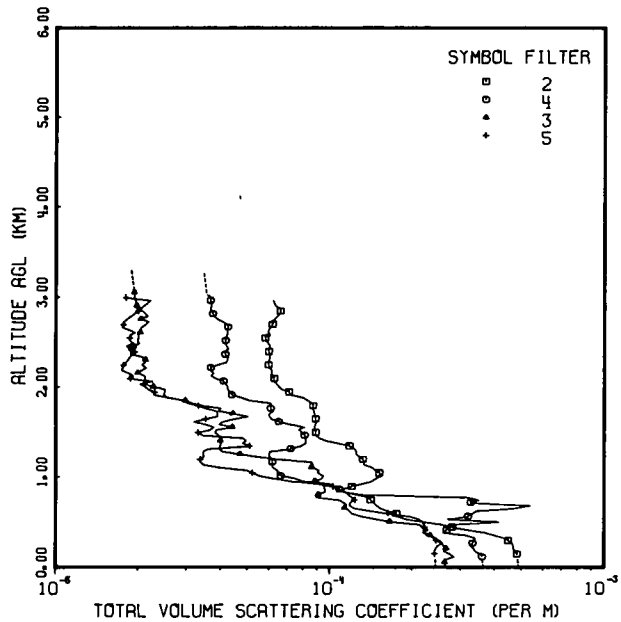
Osnabrück, 89 kilometers south of the track center, observed 7/8 to 8/8 stratocumulus at 690 to 1200 meters (2300 to 4000 feet) with visibilities 10 to 15 kilometers.

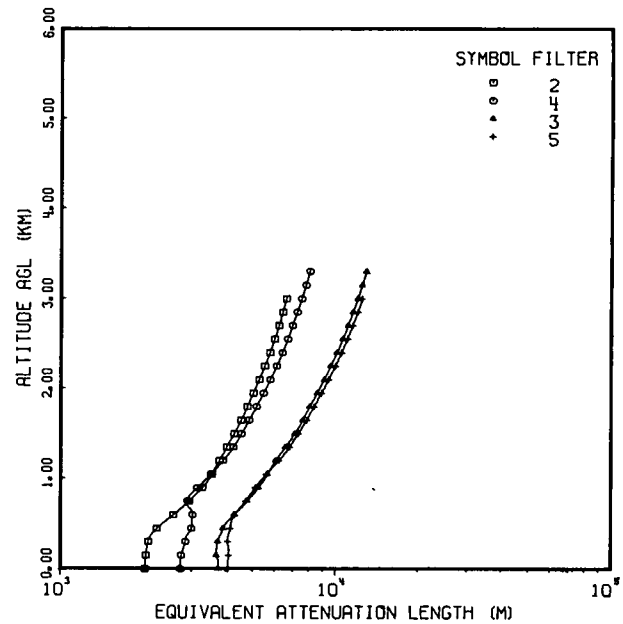
Emden, 46 kilometers northwest of the track center, had 8/8 stratus and stratocumulus clouds with bases 240 to 540 meters (800 to 1800 feet) and 6/8 cirrus at 7200 meters (24,000 feet) with visibility 6 to 8 kilometers in light fog.

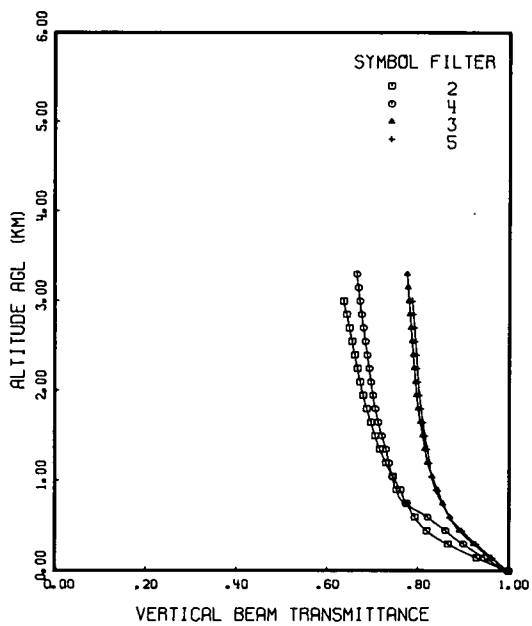
The radiosonde station near Bergen was downstream from the track. Vertical cross section data showed 8/8 clouds from 600 to 1200 meters, 2/8 cover at 3000 meters, and 3/8 cloud at 4400 meters over the Meppen area.

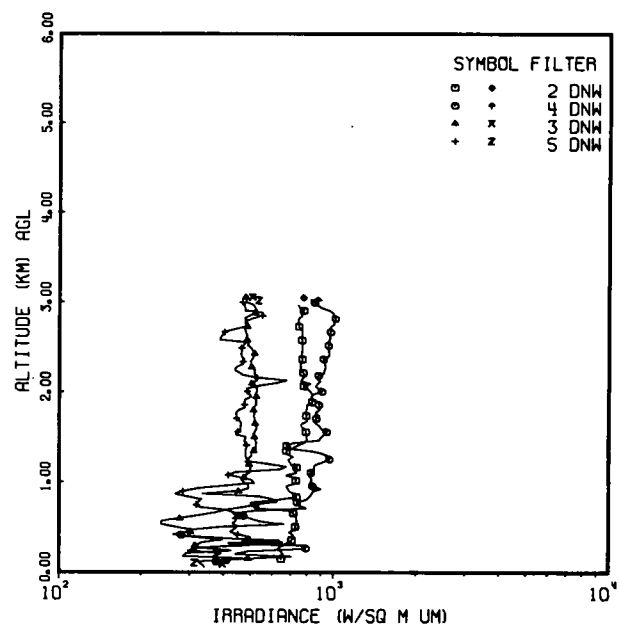
Synoptic Remarks. The surface map had an occlusion that extended from Iceland to central Sweden then southeast to Latvia. A cold front extended westward from central Latvia through Poland to Berlin then as a wave through Hannover to Amsterdam and the Irish Sea, then as a cold front southsouthwest into the Atlantic. The flight track area showed pre-warm frontal conditions. At 500 millibars there was ridging from Algeria to Norway with westerly flow at this level. The air mass was stable maritime polar.

FLIGHT NO. C-453
MEPPEN









FLIGHT NO. C-453
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6674 DATE 03/29/79)
DATE 32678 FLIGHT NO. C-453 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(4.91E-04)	(3.65E-04)	(2.66E-04)	(2.46E-04)
30	(4.89E-04)	(3.64E-04)	(2.65E-04)	(2.45E-04)
60	(4.87E-04)	(3.63E-04)	2.64E-04	(2.44E-04)
90	(4.86E-04)	(3.62E-04)	2.66E-04	(2.43E-04)
120	(4.85E-04)	3.61E-04	2.86E-04	(2.43E-04)
150	4.84E-04	3.57E-04	2.75E-04	2.42E-04
180	4.77E-04	3.41E-04	2.63E-04	2.41E-04
210	4.70E-04	3.37E-04	2.67E-04	2.46E-04
240	4.67E-04	3.28E-04	2.61E-04	2.49E-04
270	4.65E-04	3.33E-04	2.58E-04	2.59E-04
300	4.49E-04	3.41E-04	2.53E-04	2.46E-04
330	4.32E-04	3.39E-04	2.39E-04	2.43E-04
360	3.97E-04	3.13E-04	2.34E-04	2.25E-04
390	3.69E-04	2.57E-04	2.19E-04	2.26E-04
420	3.21E-04	2.68E-04	2.30E-04	2.20E-04
450	2.80E-04	2.77E-04	2.19E-04	2.23E-04
480	2.57E-04	2.87E-04	2.12E-04	2.21E-04
510	2.19E-04	4.14E-04	1.66E-04	2.18E-04
540	1.89E-04	2.70E-04	1.45E-04	2.12E-04
570	1.75E-04	3.21E-04	1.29E-04	1.94E-04
600	1.75E-04	3.33E-04	1.20E-04	1.64E-04
630	1.61E-04	3.46E-04	1.13E-04	1.46E-04
660	1.53E-04	4.79E-04	1.14E-04	1.22E-04
690	1.43E-04	5.38E-04	1.16E-04	1.18E-04
720	1.45E-04	5.27E-04	1.13E-04	1.20E-04
750	1.42E-04	3.50E-04	1.08E-04	1.24E-04
780	1.38E-04	3.13E-04	8.96E-05	1.20E-04
810	1.25E-04	1.30E-04	9.10E-05	1.17E-04
840	1.13E-04	1.12E-04	9.65E-05	1.14E-04
870	1.12E-04	1.09E-04	9.61E-05	1.07E-04
900	1.21E-04	1.05E-04	9.54E-05	1.03E-04
930	1.32E-04	9.97E-05	9.58E-05	9.00E-05
960	1.43E-04	7.98E-05	8.86E-05	7.23E-05
990	1.48E-04	7.47E-05	9.42E-05	6.21E-05
1020	1.56E-04	6.64E-05	9.49E-05	5.51E-05
1050	1.52E-04	6.44E-05	9.08E-05	5.24E-05
1080	1.47E-04	6.47E-05	9.19E-05	4.97E-05
1110	1.43E-04	6.23E-05	8.60E-05	3.99E-05
1140	1.34E-04	6.19E-05	8.69E-05	3.46E-05
1170	1.34E-04	6.18E-05	8.59E-05	3.39E-05
1200	1.32E-04	6.21E-05	6.69E-05	3.37E-05
1230	1.29E-04	6.04E-05	5.47E-05	3.46E-05
1260	1.25E-04	6.04E-05	4.71E-05	3.46E-05
1290	1.26E-04	6.06E-05	4.04E-05	3.46E-05
1320	1.23E-04	7.22E-05	3.94E-05	3.63E-05
1350	1.18E-04	7.89E-05	4.00E-05	5.10E-05
1380	1.07E-04	8.17E-05	4.01E-05	4.81E-05
1410	9.62E-05	8.14E-05	4.00E-05	4.98E-05
1440	9.11E-05	8.21E-05	4.03E-05	4.82E-05
1470	8.90E-05	8.11E-05	3.93E-05	3.45E-05
1500	8.89E-05	7.94E-05	3.82E-05	3.31E-05

FLIGHT NO. C-453
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6674 DATE 03/29/79)
DATE 32878 FLIGHT NO. C-453 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	8.88E-05	7.72E-05	3.86E-05	3.68E-05
1560	8.80E-05	8.10E-05	4.43E-05	3.80E-05
1590	8.91E-05	7.18E-05	3.94E-05	3.53E-05
1620	8.94E-05	6.52E-05	4.09E-05	3.20E-05
1650	8.88E-05	6.14E-05	4.46E-05	3.52E-05
1680	8.84E-05	6.04E-05	5.04E-05	3.90E-05
1710	8.80E-05	6.05E-05	4.44E-05	3.89E-05
1740	8.76E-05	6.23E-05	3.93E-05	3.87E-05
1770	8.68E-05	6.09E-05	4.02E-05	3.50E-05
1800	8.69E-05	6.12E-05	3.45E-05	3.32E-05
1830	8.64E-05	6.11E-05	3.13E-05	3.01E-05
1860	8.28E-05	5.09E-05	2.98E-05	2.90E-05
1890	7.99E-05	4.75E-05	2.56E-05	2.60E-05
1920	7.18E-05	4.39E-05	2.48E-05	2.29E-05
1950	7.11E-05	4.35E-05	2.51E-05	2.30E-05
1980	6.67E-05	4.25E-05	2.51E-05	2.18E-05
2010	6.54E-05	4.26E-05	2.27E-05	2.12E-05
2040	6.41E-05	4.13E-05	2.09E-05	2.03E-05
2070	6.25E-05	4.10E-05	2.12E-05	2.26E-05
2100	6.27E-05	3.83E-05	2.13E-05	1.87E-05
2130	6.09E-05	3.70E-05	2.12E-05	1.93E-05
2160	6.18E-05	3.78E-05	1.99E-05	1.84E-05
2190	6.15E-05	3.69E-05	2.07E-05	1.75E-05
2220	6.01E-05	3.68E-05	2.15E-05	1.76E-05
2250	5.98E-05	3.69E-05	2.07E-05	1.77E-05
2280	5.98E-05	4.21E-05	2.13E-05	1.80E-05
2310	6.03E-05	4.23E-05	2.13E-05	1.84E-05
2340	6.05E-05	4.25E-05	2.08E-05	1.87E-05
2370	6.05E-05	4.16E-05	1.88E-05	1.91E-05
2400	5.99E-05	4.15E-05	1.89E-05	1.94E-05
2430	6.03E-05	4.29E-05	1.85E-05	1.89E-05
2460	6.07E-05	4.20E-05	1.92E-05	1.81E-05
2490	5.97E-05	4.15E-05	2.03E-05	1.92E-05
2520	5.87E-05	4.17E-05	1.99E-05	1.86E-05
2550	5.81E-05	4.19E-05	2.00E-05	1.86E-05
2580	6.08E-05	4.24E-05	2.00E-05	1.86E-05
2610	5.97E-05	4.23E-05	2.04E-05	1.96E-05
2640	6.00E-05	4.25E-05	2.03E-05	1.85E-05
2670	6.07E-05	4.26E-05	2.06E-05	1.75E-05
2700	6.19E-05	4.22E-05	2.14E-05	1.77E-05
2730	6.13E-05	4.06E-05	2.20E-05	1.77E-05
2760	6.32E-05	3.89E-05	2.05E-05	1.83E-05
2790	6.46E-05	3.78E-05	2.18E-05	1.89E-05
2820	6.60E-05	3.73E-05	2.12E-05	1.94E-05
2850	6.61E-05	3.70E-05	2.07E-05	2.00E-05
2880	6.60E-05	3.67E-05	1.97E-05	2.06E-05
2910	6.33E-05	3.70E-05	1.98E-05	2.11E-05
2940	6.28E-05	3.70E-05	1.96E-05	2.17E-05
2970	6.22E-05	3.67E-05	1.95E-05	2.23E-05
3000	(6.20E-05)	3.73E-05	1.94E-05	1.80E-05

FLIGHT NO. C-453
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6674 DATE 03/29/79)
DATE 32878 FLIGHT NO. C-453 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	FILTERS	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) 2	4	3	5
3030			3.56E-05	1.93E-05	
3060			(3.55E-05)	1.93E-05	
3090			(3.54E-05)	(1.93E-05)	
3120			(3.53E-05)	(1.92E-05)	
3150			(3.51E-05)	(1.92E-05)	
3180			(3.50E-05)	(1.91E-05)	
3210			(3.49E-05)	(1.90E-05)	
3240			(3.48E-05)	(1.90E-05)	
3270			(3.47E-05)	(1.89E-05)	
3300			(3.46E-05)	(1.89E-05)	
FIRST DATA ALT		150	120	60	150
LAST DATA ALT		2970	3030	3060	3000

FLIGHT NO. C-453
EQUIVALENT ATTENUATION LENGTH

(JOB 66/4 DATE 03/29/79)
DATE 32878 FLIGHT NO. C-453 GROUND LEVEL ALTITUDE (M)= 18

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(2.04E 03)	(2.74E 03)	(3.76E 03)	(4.07E 03)
300	2.09E 03	2.86E 03	3.75E 03	4.07E 03
600	2.59E 03	3.04E 03	4.31E 03	4.31E 03
900	3.29E 03	3.16E 03	5.27E 03	5.12E 03
1200	3.80E 03	3.91E 03	6.07E 03	6.23E 03
1500	4.29E 03	4.57E 03	7.12E 03	7.33E 03
1800	4.79E 03	5.16E 03	8.06E 03	8.35E 03
2100	5.28E 03	5.79E 03	9.09E 03	9.42E 03
2400	5.77E 03	6.41E 03	1.01E 04	1.05E 04
2700	6.22E 03	6.98E 03	1.11E 04	1.15E 04
3000	(6.62E 03)	7.53E 03	1.20E 04	1.25E 04
3300		(8.07E 03)	(1.29E 04)	

FLIGHT NO. C-453
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	8.66E-01	9.00E-01	9.23E-01	9.29E-01
600	7.93E-01	8.21E-01	8.70E-01	8.70E-01
900	7.61E-01	7.52E-01	8.43E-01	8.39E-01
1200	7.29E-01	7.36E-01	8.21E-01	8.25E-01
1500	7.05E-01	7.20E-01	8.10E-01	8.15E-01
1800	6.87E-01	7.06E-01	8.00E-01	8.06E-01
2100	6.72E-01	6.96E-01	7.94E-01	8.00E-01
2400	6.60E-01	6.88E-01	7.89E-01	7.96E-01
2700	6.48E-01	6.79E-01	7.84E-01	7.91E-01
3000	(6.36E-01)	6.71E-01	7.79E-01	7.87E-01
3300		(6.64E-01)	(7.75E-01)	

FLIGHT C-454 - 28 MARCH 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	1046	1213	1.45	52.2	51.7	52.8	4230	Sea Level
4,5	1217	1346	1.48	53.0	-	59.5	4260	Sea Level

Flight Description. Flight C-454 was an afternoon flight with data tape commencing about 1045 and landing at 1419 GMT. There were multiple cloud layers with overcast cirrus at the highest level. The approximate southeast to northwest Rodby track was located south of Lolland Island, Denmark. Typical terrain features along the nearby coast north of the track were flat cultivated farmlands interspersed with occasional woods and small towns. Directly beneath the track and to the south were the relatively shallow brown waters of Femer Bay.

In-Flight Notes. The in-flight observer reported scattered variable broken altocumulus clouds at 1500 meters (5000 feet), broken cirrostratus at 4600 meters (15,000 feet), heavy haze and slant visibility 4.8 kilometers (3 miles) at 1045 GMT. Cumulus drifted off the mainland and dissipated over the cold water and reformed as stratocumulus over Lolland. By 1130 GMT there were some scattered clouds at 300 meters (1000 feet). There were no distinct layers of haze above the heavy haze near the surface. The cirrus clouds were increasing in density to the west with an approaching frontal system. Visibility improved greatly after 1300 GMT with the approaching system. There was extensive cloudiness to the west with cloud decks moving in at several levels.

Local Weather Notes. Kegnaes, 75 kilometers west-northwest of track center, reported 7/8 cirrus and cirrostratus at 5100 meters (17,000 feet) and visibility 5 kilometers in light fog at 0900 GMT. At 1200 GMT there were 3/8 stratocumulus at 900 meters (3000 feet) and 4/8 cirrus at 5100 meters (17,000 feet) with visibility 7 kilometers in light fog. By 1500 GMT there was 8/8 altocumulus at 2400 meters (8000 feet) and 7 kilometers visibility in light fog.

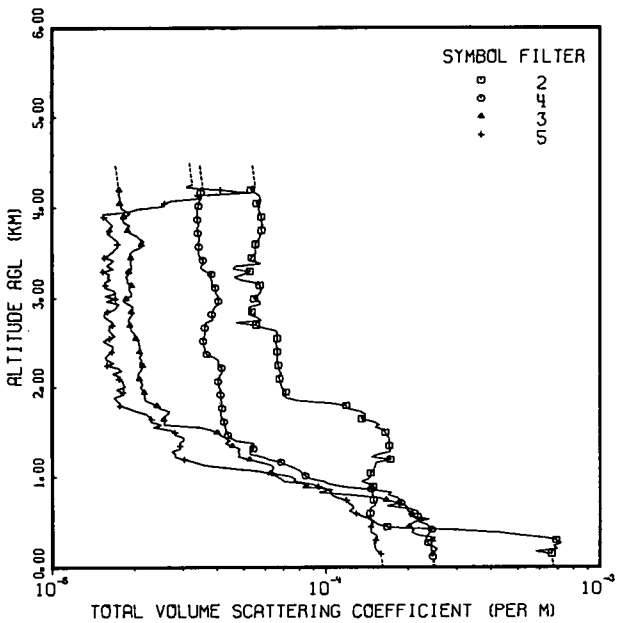
Gedser Rev, 74 kilometers east of the track center, recorded 4/8 thin cirrus at 6000 meters (20,000 feet) with 4.5 kilometers visibility in fog at 1200 GMT. At 1500 GMT there was 2/8 stratocumulus at 1050 meters (3500 feet) and 8/8 altocumulus at 3000 meters (10,000 feet) with visibility 6 kilometers in light fog.

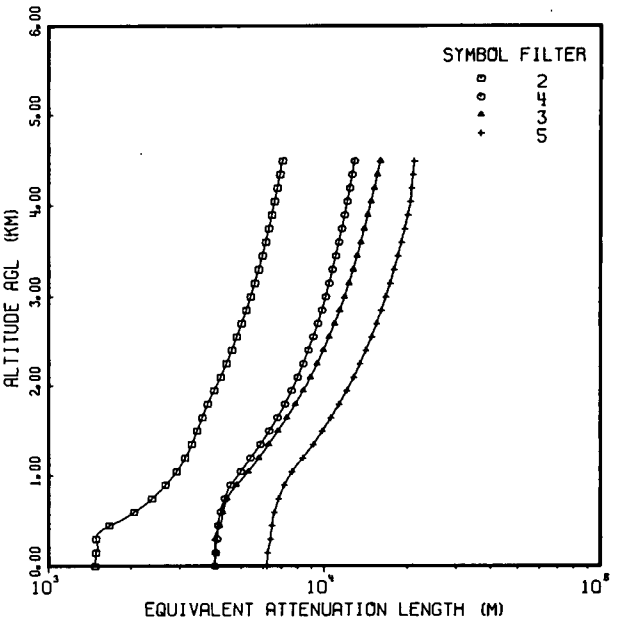
Fehmarnbelt, 10 kilometers south of the track center, had 4/8 altocumulus at 3600 meters (12,000 feet) and 6/8 thin cirrus at 6000 meters (20,000 feet) with 10 kilometers visibility.

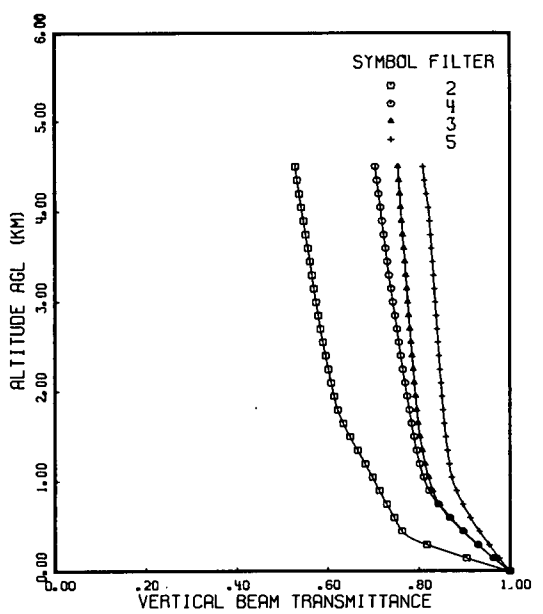
The radiosonde station at Schleswig was 102 kilometers west and in an airflow parallel to the track. The vertical cross section showed 3/8 coverage of clouds at 3000 meters at 1200 GMT.

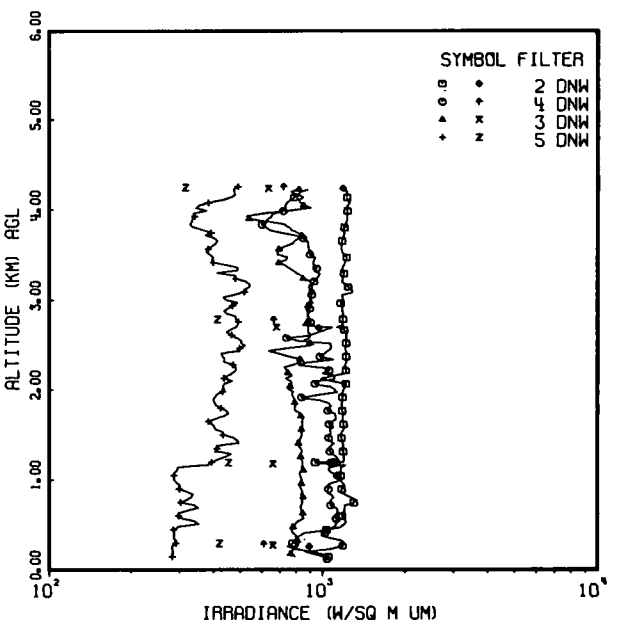
Synoptic Remarks. The surface map had an occlusion that extended from Iceland to central Sweden than southeast to Latvia. A cold front extended westward from central Latvia through Poland to Berlin then as a wave through Hannover to Amsterdam and the Irish Sea, then as a cold front southsouthwest into the Atlantic. The flight track area showed pre-warm frontal conditions. At 500 millibars there was ridging from Algeria to Norway with westerly flow at this level. The air mass was stable maritime polar.

FLIGHT NO. C-454
RODBY









FLIGHT NO. C-454
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6679 DATE 03/29/79)
DATE 32878 FLIGHT NO. C-454 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(6.76E-04)	(2.48E-04)	(2.50E-04)	(1.62E-04)
30	(6.73E-04)	(2.47E-04)	(2.49E-04)	(1.61E-04)
60	(6.71E-04)	(2.46E-04)	(2.48E-04)	(1.60E-04)
90	(6.70E-04)	(2.46E-04)	(2.48E-04)	(1.60E-04)
120	(6.68E-04)	2.45E-04	(2.47E-04)	(1.60E-04)
150	6.66E-04	2.48E-04	2.47E-04	1.59E-04
180	5.84E-04	2.43E-04	2.50E-04	1.55E-04
210	7.00E-04	2.43E-04	2.55E-04	1.52E-04
240	6.76E-04	2.42E-04	2.44E-04	1.51E-04
270	7.21E-04	2.36E-04	2.42E-04	1.50E-04
300	6.91E-04	2.32E-04	2.45E-04	1.52E-04
330	6.27E-04	2.34E-04	2.51E-04	1.54E-04
360	5.08E-04	2.36E-04	2.18E-04	1.53E-04
390	4.31E-04	2.40E-04	2.06E-04	1.46E-04
420	3.02E-04	2.44E-04	2.10E-04	1.46E-04
450	1.67E-04	2.40E-04	2.01E-04	1.46E-04
480	1.54E-04	2.32E-04	2.04E-04	1.49E-04
510	1.50E-04	2.18E-04	2.12E-04	1.47E-04
540	1.45E-04	2.18E-04	2.38E-04	1.46E-04
570	1.46E-04	2.16E-04	2.02E-04	1.36E-04
600	1.45E-04	2.17E-04	2.06E-04	1.29E-04
630	1.46E-04	2.16E-04	1.99E-04	1.22E-04
660	1.45E-04	2.00E-04	1.98E-04	1.26E-04
690	1.51E-04	1.67E-04	1.96E-04	1.25E-04
720	1.51E-04	1.88E-04	1.85E-04	1.21E-04
750	1.49E-04	1.85E-04	1.66E-04	1.19E-04
780	1.50E-04	1.83E-04	1.56E-04	1.09E-04
810	1.48E-04	1.69E-04	1.24E-04	1.05E-04
840	1.47E-04	1.73E-04	9.46E-05	1.04E-04
870	1.49E-04	1.46E-04	1.05E-04	1.02E-04
900	1.49E-04	1.16E-04	8.47E-05	9.40E-05
930	1.44E-04	1.03E-04	8.71E-05	8.92E-05
960	1.35E-04	9.81E-05	7.05E-05	7.68E-05
990	1.43E-04	8.74E-05	6.84E-05	7.73E-05
1020	1.46E-04	8.41E-05	6.56E-05	7.33E-05
1050	1.46E-04	8.20E-05	6.29E-05	6.37E-05
1080	1.49E-04	8.03E-05	6.39E-05	5.48E-05
1110	1.51E-04	7.64E-05	6.44E-05	4.34E-05
1140	1.52E-04	7.20E-05	6.34E-05	3.59E-05
1170	1.53E-04	6.86E-05	5.79E-05	3.32E-05
1200	1.72E-04	6.20E-05	5.27E-05	3.05E-05
1230	1.47E-04	5.89E-05	4.79E-05	2.81E-05
1260	1.55E-04	5.29E-05	4.86E-05	2.84E-05
1290	1.72E-04	5.30E-05	4.78E-05	2.73E-05
1320	1.71E-04	5.43E-05	4.88E-05	2.93E-05
1350	1.70E-04	5.31E-05	4.56E-05	2.93E-05
1380	1.70E-04	5.47E-05	4.29E-05	2.91E-05
1410	1.70E-04	4.67E-05	4.47E-05	3.02E-05
1440	1.70E-04	4.49E-05	4.30E-05	3.05E-05
1470	1.67E-04	4.39E-05	4.12E-05	2.84E-05
1500	1.65E-04	4.34E-05	4.01E-05	2.81E-05

FLIGHT NO. C-454
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6679 DATE 03/29/79)
DATE 32878 FLIGHT NO. C-454 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	1.62E-04	4.30E-05	3.79E-05	2.70E-05
1560	1.51E-04	4.29E-05	3.46E-05	2.35E-05
1590	1.57E-04	4.26E-05	2.56E-05	2.51E-05
1620	1.50E-04	4.24E-05	2.59E-05	2.31E-05
1650	1.35E-04	4.21E-05	2.56E-05	2.31E-05
1680	1.39E-04	4.15E-05	2.58E-05	2.25E-05
1710	1.39E-04	4.12E-05	2.65E-05	2.21E-05
1740	1.32E-04	4.13E-05	2.68E-05	2.02E-05
1770	1.19E-04	4.17E-05	2.48E-05	1.92E-05
1800	1.18E-04	4.17E-05	2.42E-05	1.77E-05
1830	1.03E-04	4.16E-05	2.32E-05	1.77E-05
1860	7.88E-05	4.14E-05	2.20E-05	1.73E-05
1890	7.15E-05	4.15E-05	2.18E-05	1.69E-05
1920	6.98E-05	4.12E-05	2.18E-05	1.79E-05
1950	7.14E-05	4.12E-05	2.17E-05	1.82E-05
1980	7.01E-05	4.13E-05	2.14E-05	1.72E-05
2010	6.89E-05	4.07E-05	2.10E-05	1.85E-05
2040	6.84E-05	4.06E-05	2.15E-05	1.82E-05
2070	6.81E-05	4.04E-05	2.12E-05	1.81E-05
2100	6.76E-05	4.07E-05	2.09E-05	1.76E-05
2130	6.71E-05	4.08E-05	2.06E-05	1.77E-05
2160	6.89E-05	4.15E-05	2.06E-05	1.66E-05
2190	6.75E-05	4.18E-05	2.11E-05	1.79E-05
2220	6.72E-05	4.16E-05	2.13E-05	1.75E-05
2250	6.69E-05	4.07E-05	2.14E-05	1.59E-05
2280	6.65E-05	4.04E-05	2.10E-05	1.68E-05
2310	6.65E-05	4.05E-05	2.13E-05	1.59E-05
2340	6.66E-05	3.89E-05	2.08E-05	1.57E-05
2370	6.65E-05	3.67E-05	2.14E-05	1.61E-05
2400	6.64E-05	3.63E-05	2.09E-05	1.65E-05
2430	6.62E-05	3.61E-05	2.11E-05	1.66E-05
2460	6.63E-05	3.59E-05	2.09E-05	1.67E-05
2490	6.57E-05	3.58E-05	2.08E-05	1.61E-05
2520	6.64E-05	3.56E-05	2.07E-05	1.54E-05
2550	6.64E-05	3.58E-05	2.02E-05	1.62E-05
2580	6.64E-05	3.61E-05	2.01E-05	1.70E-05
2610	6.64E-05	3.63E-05	2.00E-05	1.65E-05
2640	6.61E-05	3.62E-05	1.95E-05	1.61E-05
2670	5.90E-05	3.61E-05	1.94E-05	1.63E-05
2700	5.56E-05	3.66E-05	1.93E-05	1.66E-05
2730	4.71E-05	3.64E-05	1.91E-05	1.67E-05
2760	5.81E-05	3.86E-05	1.90E-05	1.62E-05
2790	5.58E-05	3.84E-05	1.93E-05	1.56E-05
2820	5.24E-05	3.82E-05	1.96E-05	1.55E-05
2850	5.36E-05	3.87E-05	1.95E-05	1.59E-05
2880	5.30E-05	3.89E-05	1.96E-05	1.70E-05
2910	5.24E-05	3.94E-05	1.98E-05	1.73E-05
2940	5.76E-05	4.07E-05	1.90E-05	1.76E-05
2970	5.72E-05	4.05E-05	1.83E-05	1.58E-05
3000	5.47E-05	4.06E-05	1.86E-05	1.70E-05

FLIGHT NO. C-454
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6679 DATE 03/29/79)
DATE 32878 FLIGHT NO. C-454 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	5.60E-05	4.03E-05	1.94E-05	1.56E-05
3060	5.73E-05	3.97E-05	1.96E-05	1.71E-05
3090	5.79E-05	3.98E-05	1.92E-05	1.68E-05
3120	5.77E-05	3.94E-05	1.92E-05	1.58E-05
3150	5.74E-05	3.85E-05	1.95E-05	1.57E-05
3180	5.51E-05	3.84E-05	1.89E-05	1.56E-05
3210	4.86E-05	3.83E-05	1.90E-05	1.64E-05
3240	4.63E-05	3.80E-05	1.87E-05	1.59E-05
3270	5.00E-05	3.82E-05	1.91E-05	1.63E-05
3300	5.28E-05	3.66E-05	1.91E-05	1.54E-05
3330	4.58E-05	3.51E-05	1.96E-05	1.68E-05
3360	4.69E-05	3.51E-05	1.95E-05	1.59E-05
3390	5.78E-05	3.58E-05	1.93E-05	1.64E-05
3420	5.24E-05	3.56E-05	1.94E-05	1.59E-05
3450	5.36E-05	3.47E-05	1.94E-05	1.56E-05
3480	5.48E-05	3.44E-05	1.93E-05	1.61E-05
3510	5.56E-05	3.42E-05	1.95E-05	1.67E-05
3540	5.51E-05	3.45E-05	2.01E-05	1.70E-05
3570	5.55E-05	3.44E-05	2.12E-05	1.74E-05
3600	5.54E-05	3.43E-05	2.13E-05	1.74E-05
3630	5.62E-05	3.45E-05	2.17E-05	1.74E-05
3660	5.71E-05	3.47E-05	2.09E-05	1.69E-05
3690	5.77E-05	3.43E-05	2.04E-05	1.64E-05
3720	5.84E-05	3.41E-05	1.94E-05	1.59E-05
3750	5.83E-05	3.41E-05	1.89E-05	1.62E-05
3780	5.86E-05	3.40E-05	1.89E-05	1.64E-05
3810	5.88E-05	3.45E-05	1.93E-05	1.66E-05
3840	5.83E-05	3.41E-05	1.83E-05	1.63E-05
3870	5.82E-05	3.40E-05	1.83E-05	1.59E-05
3900	5.82E-05	3.39E-05	1.83E-05	1.55E-05
3930	5.78E-05	3.41E-05	1.93E-05	1.54E-05
3960	5.74E-05	3.40E-05	1.88E-05	1.92E-05
3990	5.68E-05	3.40E-05	1.81E-05	2.08E-05
4020	5.75E-05	3.44E-05	1.79E-05	2.54E-05
4050	5.59E-05	3.47E-05	1.77E-05	2.58E-05
4080	5.81E-05	3.46E-05	1.78E-05	2.75E-05
4110	5.75E-05	3.53E-05	1.78E-05	3.52E-05
4140	5.71E-05	3.50E-05	1.76E-05	3.32E-05
4170	5.52E-05	3.50E-05	1.76E-05	3.18E-05
4200	5.33E-05	3.49E-05	1.76E-05	4.14E-05
4230	5.53E-05	3.55E-05	1.75E-05	3.10E-05
4260	(5.52E-05)	(3.54E-05)	(1.75E-05)	3.26E-05
4290	(5.50E-05)	(3.53E-05)	(1.74E-05)	(3.25E-05)
4320	(5.48E-05)	(3.52E-05)	(1.74E-05)	(3.24E-05)
4350	(5.47E-05)	(3.51E-05)	(1.73E-05)	(3.23E-05)
4380	(5.45E-05)	(3.50E-05)	(1.72E-05)	(3.22E-05)
4410	(5.43E-05)	(3.49E-05)	(1.72E-05)	(3.21E-05)
4440	(5.42E-05)	(3.48E-05)	(1.71E-05)	(3.20E-05)
4470	(5.40E-05)	(3.47E-05)	(1.71E-05)	(3.19E-05)
4500	(5.38E-05)	(3.46E-05)	(1.70E-05)	(3.18E-05)
FIRST DATA ALT	150	120	150	150
LAST DATA ALT	4230	4230	4230	4290

FLIGHT NO. C-454
EQUIVALENT ATTENUATION LENGTH

(JOB 6679 DATE 03/29/79)
DATE 32878 FLIGHT NO. C-454 GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(1.48E 03)	(4.03E 03)	(4.00E 03)	(6.19E 03)
300	1.49E 03	4.10E 03	4.04E 03	6.39E 03
600	2.05E 03	4.22E 03	4.31E 03	6.60E 03
900	2.67E 03	4.59E 03	4.83E 03	7.19E 03
1200	3.14E 03	5.43E 03	5.81E 03	8.36E 03
1500	3.48E 03	6.34E 03	6.81E 03	9.85E 03
1800	3.79E 03	7.22E 03	7.86E 03	1.13E 04
2100	4.22E 03	8.03E 03	8.92E 03	1.28E 04
2400	4.64E 03	8.77E 03	9.93E 03	1.42E 04
2700	5.03E 03	9.49E 03	1.09E 04	1.55E 04
3000	5.42E 03	1.01E 04	1.18E 04	1.67E 04
3300	5.80E 03	1.07E 04	1.27E 04	1.79E 04
3600	6.15E 03	1.13E 04	1.36E 04	1.90E 04
3900	6.47E 03	1.19E 04	1.44E 04	2.01E 04
4200	6.78E 03	1.24E 04	1.52E 04	2.07E 04
4500	(7.07E 03)	(1.29E 04)	(1.60E 04)	(2.12E 04)

FLIGHT NO. C-454
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

$\tau_{R_1} = 0.0423$

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	8.18E-01	9.30E-01	9.28E-01	9.54E-01
600	7.46E-01	8.68E-01	8.70E-01	9.13E-01
900	7.14E-01	8.22E-01	8.30E-01	8.82E-01
1200	6.83E-01	8.02E-01	8.13E-01	8.66E-01
1500	6.49E-01	7.89E-01	8.02E-01	8.59E-01
1800	6.22E-01	7.79E-01	7.95E-01	8.53E-01
2100	6.08E-01	7.70E-01	7.90E-01	8.48E-01
2400	5.96E-01	7.61E-01	7.85E-01	8.44E-01
2700	5.85E-01	7.52E-01	7.81E-01	8.40E-01
3000	5.75E-01	7.44E-01	7.76E-01	8.36E-01
3300	5.66E-01	7.35E-01	7.72E-01	8.32E-01
3600	5.57E-01	7.27E-01	7.67E-01	8.28E-01
3900	5.47E-01	7.20E-01	7.63E-01	8.24E-01
4200	5.38E-01	7.13E-01	7.58E-01	8.17E-01
4500	(5.29E-01)	(7.05E-01)	(7.54E-01)	(8.09E-01)

FLIGHT C-456A - 31 MARCH 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2,3	1303	1340	0.62	54.7	-	58.0	1200	Sea Level
4,5	1344	1416	0.53	58.3	-	61.8	780	Sea Level

Flight Description. Flight C-456A was an afternoon flight with take off at 1205 and data tape ending about 1419 GMT. There were multiple cloud layers with overcast cirrus at the highest level. The approximate north to south Rodby track was located 3 miles east of Langeland Island, Denmark. Typical terrain features along the nearby coast were flat cultivated farmlands interspersed with occasional woods and small towns. Directly beneath the track were the relatively shallow waters of Femer Bay.

In-Flight Notes. The in-flight observer noted scattered to broken stratocumulus with bases varying from 610 to 910 meters (2000 to 3000 feet), scattered altocumulus at 2700 meters (9000 feet), broken altostratus at 4300 meters (14,000 feet) and overcast cirrus at 6100 meters (20,000 feet). There was light haze with slant visibility varying from 9.6 to 16 kilometers (6 to 10 miles). Gradually heavier higher clouds moved into the area and the stratus layer was thin but on occasion heavier.

Local Weather Notes. Kegnaes, 75 kilometers west-northwest of the track, reported 6/8 altocumulus at 3000 meters (10,000 feet) and 7/8 cirrus at 6000 meters (20,000 feet) with 15 kilometers visibility at 1200 GMT.

Gedser Rev, 74 kilometers east of the track, recorded 8/8 altostratus at 3000 meters (10,000 feet) with visibility 22 kilometers at 1200 GMT.

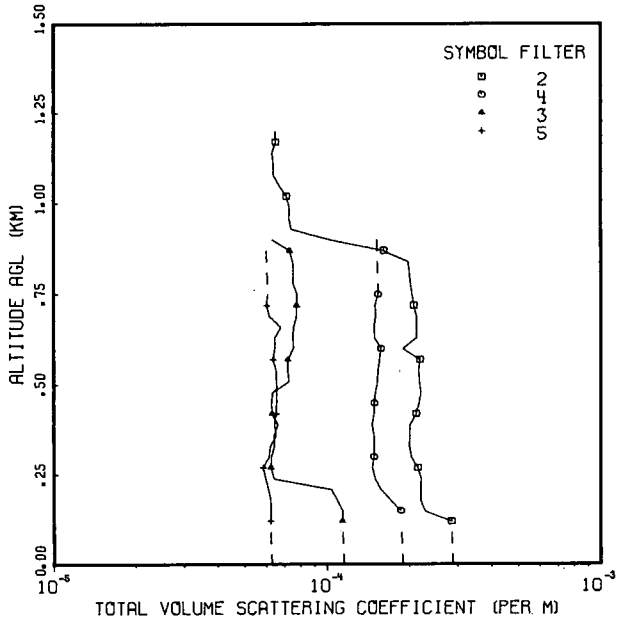
Fehmarnbelt, 10 kilometers south of the track, observed 7/8 cumulus and stratocumulus at 450 meters (1500 feet) with 10 kilometers visibility at 1200 GMT.

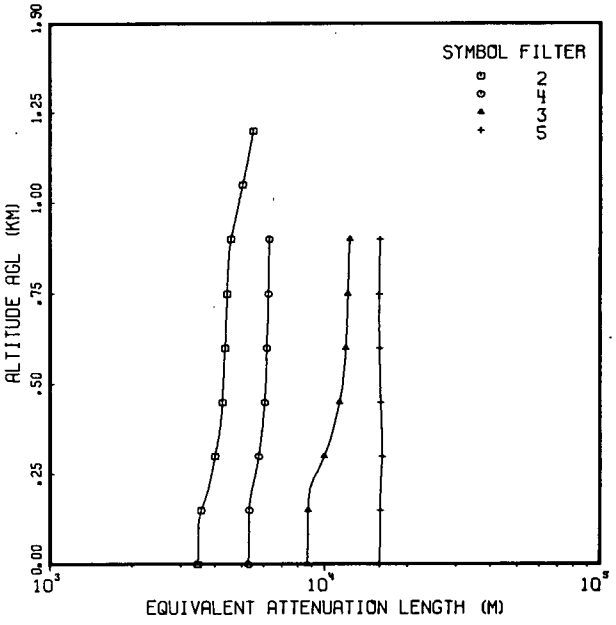
The radiosonde station at Schleswig was 102 kilometers west and downstream from the track. The vertical cross section for 1200 GMT indicated 7/8 clouds at 600 to 1100 meters and 2/8 coverage at 3000 to 4400 meters with no higher clouds.

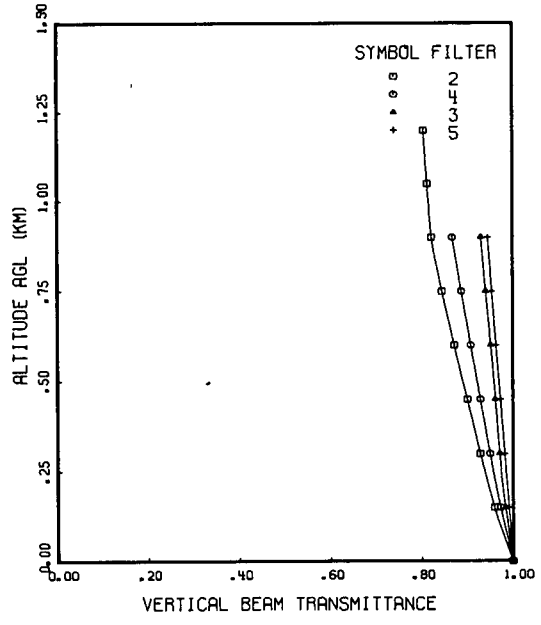
Synoptic Remarks. The surface chart had a weakening cold front along a line Helsinki, Kaliningrad, Vienna, Florence, Naples, Siracusa and Tripoli. There was a small 1013 millibars high located near Alborg, Denmark. On the surface the anticyclonic circulation of the high brought moist air from the North Sea through the Kattegat to Femer Bay. At 500 millibars there was a low west of Ireland and another in eastern Sardinia with a trough connecting them. The flow at this level was southwesterly and the air mass was stable maritime polar.

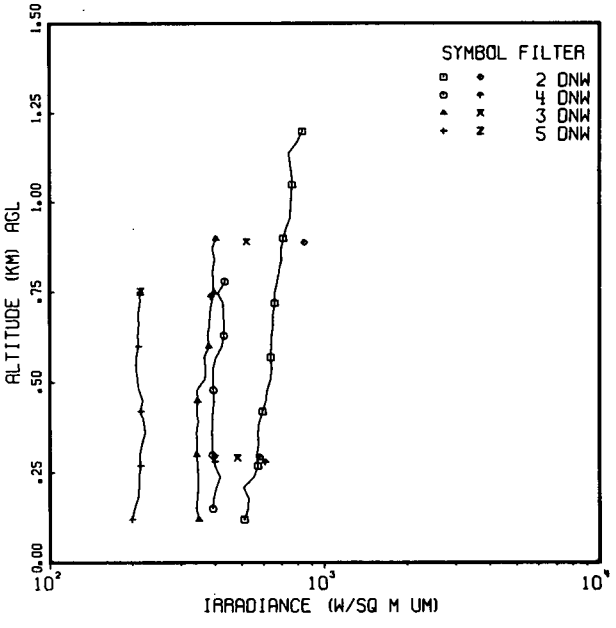
FLIGHT NO. C-456A

RODBY









FLIGHT NO. C-456A
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6681 DATE 03/29/79)
DATE 33178 FLIGHT NO. C-456A GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(2.89E-04)	(1.89E-04)	(1.15E-04)	(6.30E-05)
30	(2.87E-04)	(1.88E-04)	(1.15E-04)	(6.27E-05)
60	(2.86E-04)	(1.88E-04)	(1.14E-04)	(6.25E-05)
90	(2.86E-04)	(1.87E-04)	(1.14E-04)	(6.24E-05)
120	2.85E-04	(1.87E-04)	1.14E-04	6.22E-05
150	2.28E-04	1.86E-04	1.14E-04	6.25E-05
180	2.20E-04	1.71E-04	1.09E-04	6.22E-05
210	2.20E-04	1.58E-04	1.04E-04	6.11E-05
240	2.21E-04	1.50E-04	6.39E-05	5.97E-05
270	2.14E-04	1.46E-04	6.24E-05	5.84E-05
300	2.03E-04	1.49E-04	6.26E-05	6.14E-05
330	2.00E-04	1.48E-04	6.41E-05	6.21E-05
360	2.01E-04	1.48E-04	6.40E-05	6.51E-05
390	2.01E-04	1.46E-04	6.62E-05	6.44E-05
420	2.12E-04	1.48E-04	6.31E-05	6.52E-05
450	2.17E-04	1.49E-04	6.26E-05	6.56E-05
480	2.21E-04	1.50E-04	6.33E-05	6.55E-05
510	2.18E-04	1.53E-04	7.26E-05	6.53E-05
540	2.16E-04	1.54E-04	7.19E-05	6.51E-05
570	2.19E-04	1.56E-04	7.21E-05	6.36E-05
600	1.89E-04	1.58E-04	7.54E-05	6.45E-05
630	2.12E-04	1.49E-04	7.52E-05	6.44E-05
660	2.12E-04	1.48E-04	7.56E-05	6.79E-05
690	2.12E-04	1.51E-04	7.75E-05	6.15E-05
720	2.08E-04	1.50E-04	7.76E-05	6.02E-05
750	2.05E-04	1.54E-04	7.79E-05	6.08E-05
780	2.02E-04	1.54E-04	7.52E-05	(6.06E-05)
810	2.00E-04	(1.53E-04)	7.54E-05	(6.04E-05)
840	1.98E-04	(1.53E-04)	7.50E-05	(6.02E-05)
870	1.61E-04	(1.52E-04)	7.32E-05	(6.01E-05)
900	1.03E-04	(1.52E-04)	6.32E-05	(5.99E-05)
930	7.40E-05			
960	7.25E-05			
990	7.30E-05			
1020	7.12E-05			
1050	6.71E-05			
1080	6.38E-05			
1110	6.38E-05			
1140	6.31E-05			
1170	6.50E-05			
1200	6.49E-05			
FIRST DATA ALT	120	150	120	120
LAST DATA ALT	1200	780	900	750

FLIGHT NO. C-456A
EQUIVALENT ATTENUATION LENGTH

(JOB 6681 DATE 03/29/79)
DATE 33178 FLIGHT NO. C-456A GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(3.47E 03)	(5.29E 03)	(8.67E 03)	(1.59E 04)
300	4.01E 03	5.78E 03	1.00E 04	1.62E 04
600	4.35E 03	6.13E 03	1.20E 04	1.59E 04
900	4.58E 03	(6.31E 03)	1.24E 04	(1.60E 04)
1200	5.52E 03			

FLIGHT NO. C-456A
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.28E-01	9.49E-01	9.70E-01	9.82E-01
600	8.71E-01	9.07E-01	9.51E-01	9.63E-01
900	8.22E-01	(8.67E-01)	9.30E-01	(9.45E-01)
1200	8.05E-01			

FLIGHT C-456B - 31 MARCH 1978 - DESCRIPTION OF FLIGHT & WEATHER CHARACTERISTICS

Filter Ident	Data Interval			Solar Zenith Angle			Maximum Flight Altitude (m)	Average Terrain Elevation (m)
	Start (GMT)	End (GMT)	Elapsed (hrs)	Initial ST&LV (degrees)	Solar Transit (degrees)	Final V-PRO (degrees)		
2	1429	1444	0.25	63.2	-	65.0	3660	Sea Level
3	1445	1501	0.27	65.2	-	67.2	3660	Sea Level
4	1503	1519	0.27	67.4	-	69.5	3630	Sea Level
5	1520	1534	0.23	69.7	-	71.6	3630	Sea Level

Flight Description. Flight C-456B was an afternoon flight with data tape commencing about 1423 and landing at 1638 GMT. There were scattered to broken low clouds and an overcast altostratus deck with several layers of haze. The approximate north to south Rodby track was parallel to Langeland Island, Denmark. Typical terrain features along the nearby coast were flat cultivated farmlands interspersed with occasional woods and small towns. Directly beneath the track were the relatively shallow waters of Femer Bay.

In-Flight Notes. The in-flight observer noted scattered variable broken clouds at 910 meters (3000 feet) and overcast at 4300 meters (14,000 feet). The haze top was about 850 meters (2800 feet) with occasional cumulus at the top of the haze layer. The haze layer was distinct from 2300 to 2600 meters (7500 to 8500 feet). No distinct layering was noticed except for some at 3000 to 3700 meters (10,000 to 12,000 feet). On the ascent at 1500 GMT the cloud base was lowering with bases close to 3700 meters (12,000 feet) to the east, higher to the west. Stratus was moving in from the east with the northeasterly flow.

Local Weather Notes. Kegnaes, 75 kilometers west-northwest of the track, reported 8/8 altostratus at 2700 meters (9000 feet) and visibility 15 kilometers at 1500 GMT.

Gedser Rev, 74 kilometers east of the track, recorded 7/8 stratus at 450 meters (1500 feet) and 8/8 altocumulus at 3000 meters (10,000 feet) with 22 kilometers visibility at 1500 GMT.

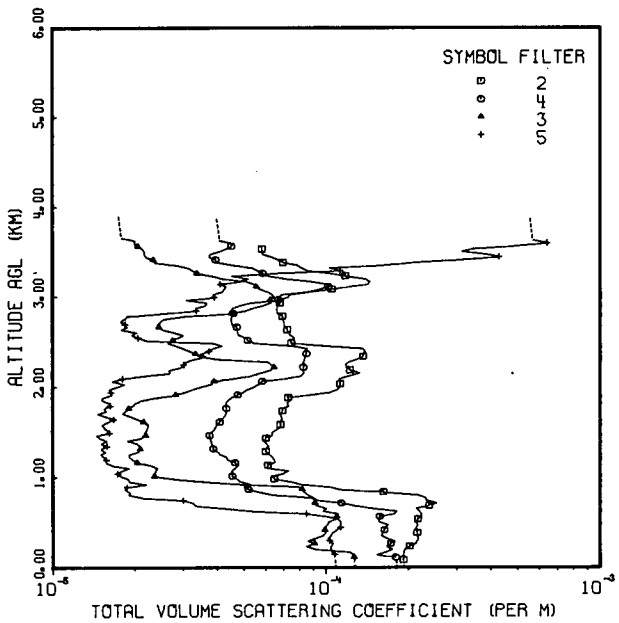
Fehmarnbelt, 10 kilometers south of the track, observed 8/8 cumulus and stratocumulus at 450 meters (1500 feet) with 10 kilometers visibility at 1500 GMT.

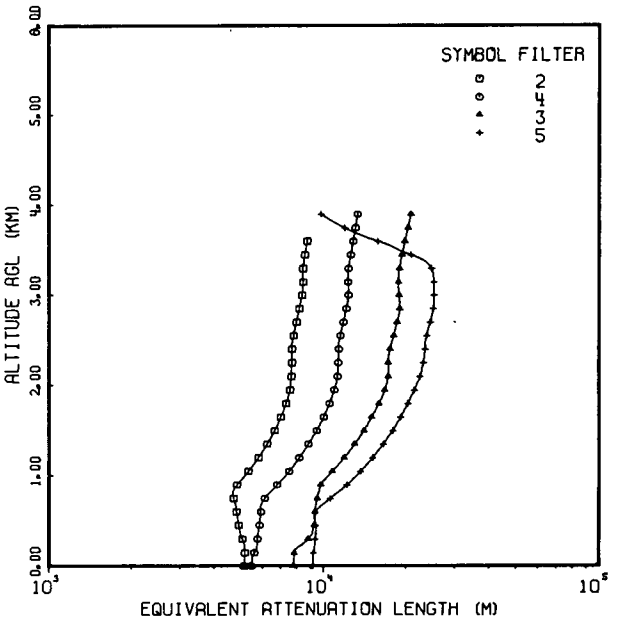
The radiosonde station at Schleswig was 102 kilometers west and downstream from the track. The vertical cross section for 1200 GMT indicated 7/8 clouds at 600 to 1100 meters and 2/8 coverage at 3000 to 4400 meters with no higher clouds.

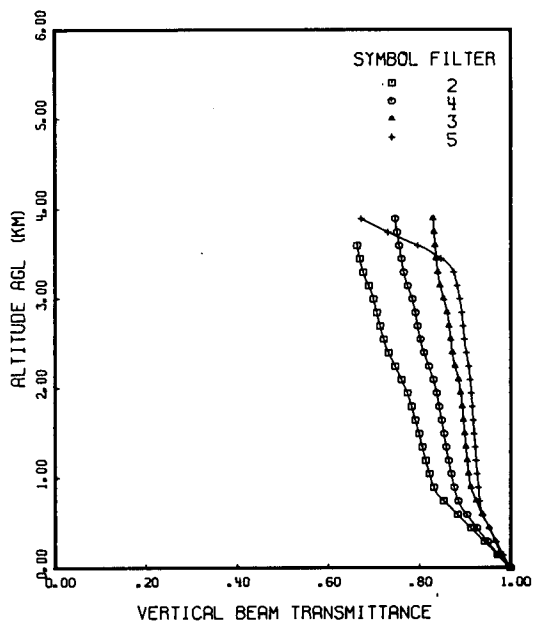
Synoptic Remarks. The surface chart had a weakening cold front along a line Helsinki, Kaliningrad, Vienna, Florence, Naples, Siracusa, and Tripoli. There was a small 1013 millibars high located near Alborg, Denmark. On the surface the anticyclonic circulation of the high brought moist air from the North Sea through the Kattegat to Femer Bay. At 500 millibars there was a low west of Ireland and another in eastern Sardinia with a trough connecting them. The flow at this level was southwesterly and the air mass was stable maritime polar.

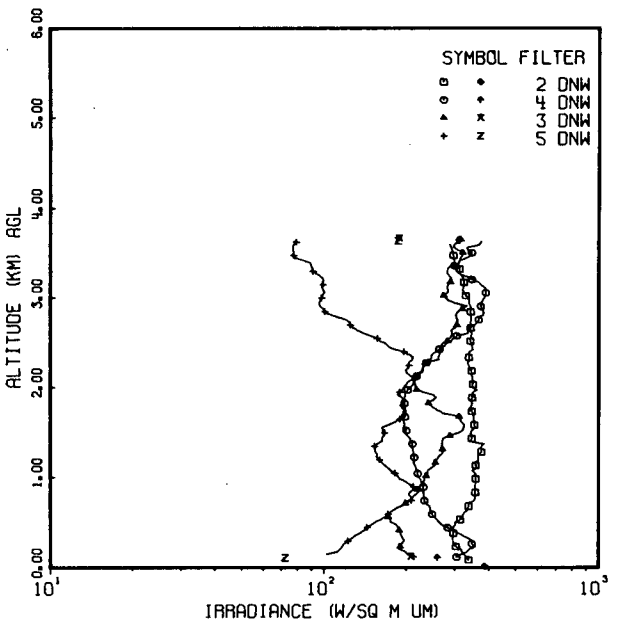
FLIGHT NO. C-456B

RODBY









FLIGHT NO. C-456B
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6687 DATE 03/29/79)
DATE 33178 FLIGHT NO. C-456B GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
0	(1.94E-04)	(1.92E-04)	(1.28E-04)	(1.09E-04)
30	(1.93E-04)	(1.81E-04)	(1.28E-04)	(1.09E-04)
60	(1.92E-04)	(1.81E-04)	(1.27E-04)	(1.09E-04)
90	1.92E-04	(1.80E-04)	(1.27E-04)	(1.08E-04)
120	1.94E-04	1.80E-04	1.27E-04	(1.08E-04)
150	1.92E-04	1.53E-04	1.28E-04	1.08E-04
180	1.93E-04	1.36E-04	1.21E-04	1.05E-04
210	1.94E-04	1.75E-04	9.12E-05	1.05E-04
240	2.02E-04	1.66E-04	8.47E-05	1.04E-04
270	2.13E-04	1.72E-04	9.09E-05	1.07E-04
300	2.16E-04	1.79E-04	8.58E-05	1.03E-04
330	2.18E-04	1.66E-04	9.18E-05	1.02E-04
360	2.16E-04	1.59E-04	9.77E-05	1.05E-04
390	2.16E-04	1.61E-04	9.97E-05	1.06E-04
420	2.13E-04	1.63E-04	9.92E-05	1.10E-04
450	2.14E-04	1.66E-04	9.95E-05	1.13E-04
480	2.17E-04	1.69E-04	1.02E-04	1.12E-04
510	2.13E-04	1.56E-04	1.02E-04	1.13E-04
540	2.17E-04	1.57E-04	1.09E-04	1.11E-04
570	2.23E-04	1.57E-04	1.10E-04	1.00E-04
600	2.23E-04	1.78E-04	1.11E-04	8.51E-05
630	2.20E-04	1.82E-04	9.77E-05	5.34E-05
660	2.14E-04	1.49E-04	1.01E-04	4.28E-05
690	2.38E-04	1.28E-04	9.25E-05	3.34E-05
720	2.55E-04	1.14E-04	9.12E-05	3.27E-05
750	2.33E-04	9.32E-05	9.29E-05	3.01E-05
780	2.31E-04	8.76E-05	9.05E-05	2.13E-05
810	2.15E-04	6.34E-05	8.61E-05	1.90E-05
840	1.62E-04	5.71E-05	8.33E-05	1.93E-05
870	1.12E-04	5.20E-05	8.18E-05	1.84E-05
900	1.02E-04	5.00E-05	7.94E-05	1.87E-05
930	8.01E-05	5.29E-05	4.80E-05	2.21E-05
960	7.40E-05	4.85E-05	3.56E-05	1.91E-05
990	6.47E-05	4.72E-05	2.79E-05	1.90E-05
1020	6.39E-05	4.54E-05	2.36E-05	1.78E-05
1050	7.03E-05	4.57E-05	2.37E-05	1.73E-05
1080	7.29E-05	4.53E-05	2.39E-05	1.80E-05
1110	6.10E-05	4.66E-05	2.43E-05	1.91E-05
1140	6.13E-05	4.78E-05	2.30E-05	1.66E-05
1170	6.50E-05	4.65E-05	2.05E-05	1.58E-05
1200	6.47E-05	4.36E-05	1.97E-05	1.58E-05
1230	6.38E-05	4.34E-05	1.92E-05	1.54E-05
1260	6.20E-05	4.09E-05	1.90E-05	1.50E-05
1290	6.03E-05	4.02E-05	2.06E-05	1.57E-05
1320	6.06E-05	3.87E-05	2.10E-05	1.50E-05
1350	6.16E-05	3.88E-05	2.09E-05	1.58E-05
1380	6.06E-05	3.82E-05	2.04E-05	1.51E-05
1410	5.94E-05	3.79E-05	1.88E-05	1.59E-05
1440	6.03E-05	3.76E-05	2.11E-05	1.49E-05
1470	6.34E-05	3.75E-05	2.20E-05	1.45E-05
1500	6.34E-05	3.78E-05	2.18E-05	1.62E-05

FLIGHT NO. C-456B
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6687 DATE 03/29/79)
DATE 33178 FLIGHT NO. C-456B GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
1530	6.56E-05	3.90E-05	2.21E-05	1.58E-05
1560	6.80E-05	3.93E-05	2.23E-05	1.55E-05
1590	6.82E-05	3.98E-05	2.25E-05	1.52E-05
1620	6.79E-05	4.09E-05	2.15E-05	1.60E-05
1650	6.91E-05	4.17E-05	2.04E-05	1.67E-05
1680	6.85E-05	4.25E-05	1.94E-05	1.57E-05
1710	6.82E-05	4.31E-05	1.81E-05	1.46E-05
1740	6.93E-05	4.32E-05	1.85E-05	1.57E-05
1770	6.99E-05	4.32E-05	1.90E-05	1.55E-05
1800	7.31E-05	4.34E-05	1.97E-05	1.62E-05
1830	7.23E-05	4.31E-05	2.01E-05	1.61E-05
1860	7.35E-05	4.39E-05	2.12E-05	1.52E-05
1890	7.28E-05	4.52E-05	2.37E-05	1.53E-05
1920	8.74E-05	4.76E-05	2.82E-05	1.65E-05
1950	1.04E-04	5.00E-05	3.05E-05	1.64E-05
1980	1.11E-04	5.18E-05	3.25E-05	1.61E-05
2010	1.12E-04	5.47E-05	3.51E-05	1.72E-05
2040	1.13E-04	5.70E-05	3.83E-05	1.84E-05
2070	1.14E-04	5.85E-05	3.90E-05	1.65E-05
2100	1.12E-04	7.13E-05	4.56E-05	1.80E-05
2130	1.22E-04	8.14E-05	5.33E-05	2.11E-05
2160	1.33E-04	8.31E-05	5.78E-05	2.69E-05
2190	1.22E-04	8.27E-05	6.29E-05	2.67E-05
2220	1.19E-04	8.27E-05	6.47E-05	2.96E-05
2250	1.18E-04	8.42E-05	6.30E-05	3.02E-05
2280	1.22E-04	8.25E-05	6.14E-05	3.07E-05
2310	1.30E-04	8.38E-05	4.10E-05	3.29E-05
2340	1.37E-04	8.43E-05	3.49E-05	3.64E-05
2370	1.38E-04	8.49E-05	3.34E-05	3.49E-05
2400	1.39E-04	8.48E-05	3.19E-05	3.73E-05
2430	1.36E-04	8.56E-05	3.01E-05	3.87E-05
2460	9.81E-05	7.46E-05	2.83E-05	4.18E-05
2490	7.46E-05	5.45E-05	2.65E-05	3.82E-05
2520	7.43E-05	5.17E-05	2.75E-05	2.20E-05
2550	7.69E-05	5.09E-05	2.88E-05	2.06E-05
2580	7.39E-05	4.80E-05	3.01E-05	1.95E-05
2610	7.31E-05	4.76E-05	2.76E-05	2.04E-05
2640	7.22E-05	4.73E-05	2.53E-05	1.79E-05
2670	7.07E-05	4.72E-05	2.45E-05	1.88E-05
2700	7.04E-05	4.54E-05	2.43E-05	1.85E-05
2730	7.01E-05	4.51E-05	2.49E-05	1.78E-05
2760	6.98E-05	4.49E-05	2.56E-05	1.85E-05
2790	6.93E-05	4.54E-05	3.03E-05	1.89E-05
2820	6.64E-05	4.59E-05	4.51E-05	2.50E-05
2850	6.64E-05	4.51E-05	5.09E-05	3.36E-05
2880	6.65E-05	4.58E-05	5.42E-05	3.37E-05
2910	6.66E-05	4.88E-05	5.90E-05	3.64E-05
2940	6.80E-05	5.34E-05	6.30E-05	3.66E-05
2970	6.79E-05	6.71E-05	6.26E-05	3.09E-05
3000	6.78E-05	7.28E-05	6.45E-05	3.90E-05

FLIGHT NO. C-456B
TOTAL VOLUME SCATTERING COEFFICIENT

(JOB 6687 DATE 03/29/79)
DATE 33178 FLIGHT NO. C-456B GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	TOTAL VOLUME SCATTERING COEFFICIENT (PER M) FILTERS 2	4	3	5
3030	6.87E-05	7.37E-05	6.37E-05	3.88E-05
3060	8.54E-05	8.68E-05	6.12E-05	4.18E-05
3090	1.05E-04	9.49E-05	5.75E-05	4.24E-05
3120	1.22E-04	1.02E-04	5.55E-05	4.32E-05
3150	1.43E-04	1.01E-04	5.46E-05	4.12E-05
3180	1.45E-04	8.79E-05	5.09E-05	4.86E-05
3210	1.39E-04	7.13E-05	4.20E-05	5.20E-05
3240	1.18E-04	6.18E-05	3.81E-05	4.54E-05
3270	1.03E-04	5.87E-05	3.38E-05	6.34E-05
3300	8.56E-05	5.61E-05	3.26E-05	1.12E-04
3330	8.14E-05	5.38E-05	3.13E-05	1.03E-04
3360	7.84E-05	4.60E-05	2.83E-05	1.63E-04
3390	6.96E-05	4.02E-05	2.36E-05	2.09E-04
3420	6.71E-05	3.95E-05	2.34E-05	3.18E-04
3450	6.32E-05	3.75E-05	2.21E-05	4.28E-04
3480	5.87E-05	3.77E-05	2.17E-05	3.80E-04
3510	5.85E-05	4.05E-05	2.17E-05	3.14E-04
3540	5.83E-05	4.32E-05	2.14E-05	3.44E-04
3570	5.83E-05	4.52E-05	2.05E-05	4.91E-04
3600	5.94E-05	4.60E-05	1.99E-05	6.41E-04
3630		4.09E-05	2.02E-05	5.70E-04
3660		(4.07E-05)	1.79E-05	(5.68E-04)
3690		(4.06E-05)	(1.79E-05)	(5.66E-04)
3720		(4.05E-05)	(1.78E-05)	(5.64E-04)
3750		(4.04E-05)	(1.77E-05)	(5.63E-04)
3780		(4.02E-05)	(1.77E-05)	(5.61E-04)
3810		(4.01E-05)	(1.76E-05)	(5.59E-04)
3840		(4.00E-05)	(1.76E-05)	(5.57E-04)
3870		(3.99E-05)	(1.75E-05)	(5.56E-04)
3900		(3.97E-05)	(1.75E-05)	(5.54E-04)
FIRST DATA ALT	90	120	120	150
LAST DATA ALT	3600	3630	3660	3630

FLIGHT NO. C-456B
EQUIVALENT ATTENUATION LENGTH

(JOB 6687 DATE 03/29/79)
DATE 33178 FLIGHT NO. C-456B GROUND LEVEL ALTITUDE (M)= 0

ALTITUDE (M)	EQUIVALENT ATTENUATION LENGTH (M) FILTERS 2	4	3	5
0	(5.16E 03)	(5.49E 03)	(7.79E 03)	(9.15E 03)
300	5.08E 03	5.76E 03	8.83E 03	9.36E 03
600	4.84E 03	5.94E 03	9.34E 03	9.37E 03
900	4.86E 03	6.81E 03	9.83E 03	1.22E 04
1200	5.82E 03	8.20E 03	1.19E 04	1.52E 04
1500	6.68E 03	9.48E 03	1.41E 04	1.79E 04
1800	7.34E 03	1.05E 04	1.60E 04	2.03E 04
2100	7.67E 03	1.13E 04	1.72E 04	2.25E 04
2400	7.70E 03	1.14E 04	1.75E 04	2.35E 04
2700	8.00E 03	1.18E 04	1.86E 04	2.45E 04
3000	8.38E 03	1.23E 04	1.88E 04	2.53E 04
3300	8.44E 03	1.24E 04	1.89E 04	2.47E 04
3600	8.76E 03	1.29E 04	1.98E 04	1.58E 04
3900		(1.33E 04)	(2.08E 04)	(9.82E 03)

FLIGHT NO. C-456B
VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE

ALTITUDE (M)	VERTICAL BEAM TRANSMITTANCE FROM GROUND TO ALTITUDE FILTERS 2	4	3	5
0	1.00E 00	1.00E 00	1.00E 00	1.00E 00
300	9.43E-01	9.49E-01	9.67E-01	9.68E-01
600	8.83E-01	9.04E-01	9.38E-01	9.38E-01
900	8.31E-01	8.76E-01	9.12E-01	9.29E-01
1200	8.14E-01	8.64E-01	9.04E-01	9.24E-01
1500	7.99E-01	8.54E-01	8.99E-01	9.20E-01
1800	7.83E-01	8.43E-01	8.93E-01	9.15E-01
2100	7.61E-01	8.30E-01	8.85E-01	9.11E-01
2400	7.32E-01	8.10E-01	8.72E-01	9.03E-01
2700	7.14E-01	7.96E-01	8.65E-01	8.96E-01
3000	6.99E-01	7.84E-01	8.53E-01	8.88E-01
3300	6.76E-01	7.66E-01	8.40E-01	8.75E-01
3600	6.63E-01	7.56E-01	8.34E-01	7.97E-01
3900		(7.47E-01)	(8.29E-01)	(6.72E-01)

8. DATA INTERPRETATION AND EVALUATION

8.1. METEOROLOGICAL DATA

The basic discussion of meteorological conditions, as presented in Section 6 and summarized with each flight description, is based upon meteorological data from a number of sources. There are hourly observations from two or more weather stations for every flight. There are synoptic maps and radiosonde measurements of temperature and relative humidity. From the C-130 flight itself, there are in-flight observations by an on-board meteorologist and in-flight hemispherical pictures of the sky. In addition, there are airborne measurements of temperature and dewpoint temperature during each flight.

CLOUD CONDITIONS

The airborne meteorological observations and in-flight pictures which documented the cloud conditions during each flight were described in Table 7.2.

The flights from all the European deployments, both HAVENVIEW and OPAQUE, as summarized in Duntley, *et al.* (1978c) were grouped into five categories: I clear during the entire flight; II clear during a portion of the flight; III scattered and/or broken clouds during the entire flight; IV Broken clouds varying with overcast during the flight; and V overcast during the entire flight. The OPAQUE IV flights fell in only four of these five categories since none encountered entirely clear weather. In addition to these five categories for the upper hemisphere clouds, the lower hemisphere descriptions have been divided into two categories: 1 haze, no clouds; and 2 clouds. A summary of the flights categorized by these upper and lower hemisphere cloud conditions is presented in Table 8.1.

TEMPERATURE

The temperature measurements were made using the AN/AMQ-17 aerograph set. The graphs of temperature in Fig. 6-2 indicate reasonable agreement between the airborne temperatures and the radiosonde temperatures in view of the spatial differences between the two measurements. The RAOB launching was 32 to 254 kilometers from the flight track. The differences between the two profiles tend to increase with distance between RAOB station and flight track. RAOB temperatures were measured within $\pm 4.5°$ hours of the flight data times. The RAOB to flight time discrepancies are similar to the lengths of the flights from beginning to end.

Table 8.1. Cloud Condition Summary*

Upper Hemisphere		Lower Hemisphere		Flights
Category	Description	Category	Description	
I	○ Clear	1	Haze, no clouds	None
		2	Clouds	None
II	○V◑Part clear, part scattered	1	Haze, no clouds	C-434(Filters 2,3)
		2	Clouds	C-430,C-432,C-445(Filter 2,3)
III	◑V◑ Scattered and/or Broken	1	Haze, no clouds	C-433,C-438,C-439(Filters 2,3)
		2	Clouds	C-431(Filters 2,3),C-434(Filters 4,5), C-437(Filters 2,3),C-441,C-448,C-449, C-450A,C-451,C-454(Filters 2,3)
IV	◑V⊕Part Broken, Part Overcast	1	Haze, no clouds	C-437(Filters 4,5),C-442(Filter 2)
		2	Clouds	C-440(Filters 4,5),C-452(Filter 2), C-453(Filter 2),C-454(Filters 4,5)
V	⊕ Overcast	1	Haze, no clouds	C-435,C-436,C-439(Filters 4,5), C-440(Filters 2,3),C-442(Filter 3), C-443(Filters 4,5),C-445(Filters 4,5), C-446,C-452(Filters 4,5),C-456A
		2	Clouds	C-431(Filters 4,5),C-442(Filters 4,5), C-443(Filters 2,3),C-444,C-447,C-450B, C-452(Filter 3),C-453(Filters 3,4,5),C-456B

*Categories consistent with Table 7.6 Final Report, Duntley, *et al.* (1978c).

For most of the flights the graphs in Fig. 6-2 show a relatively stable temperature function with altitude over the flight time interval. This is indicated by the general repeatability of the temperatures during each profile time interval. The temperature range at any given altitude was 2.5°C for all but four flights: C-434, C-435, C-447 and C-448. The larger temperature variability for these four flights was restricted to fairly small altitude intervals, the bulk of the temperature profile being stable with time.

Stable pronounced temperature inversions were measured on three flights: C-442, C-449 and C-453. Inversions were also indicated just above ground level on flights C-435 and C-436.

There were 28 project flights, listed in Table 7.3. They were accomplished between 31 January and 31 March 1978 at tracks from 37°24'N to 54°41'N latitude. Temperature data measured during these flights can be profitably compared to data from *U. S. Standard Atmosphere Supplements* (1966). To facilitate this comparison, the average temperature profile measured during each of the 28 flights has been superimposed on a graph of the January and Spring/Fall temperatures appropriate for 45°N latitude in Fig. 8-1. In addition the 37°N data are compared to the 30°N January standard temperature curve and the 48° to 54°N data are compared to the 60°N January standard temperature curve. The altitude scale in Fig. 8-1 is kilometers above mean sea level (MSL), and the ground elevations at the test sites range from 0 meters at four of the tracks, Trapani, Sigonella, Mildenhall and Rodby, to 762 meters at Birkhof (48°15'N).

Most of the temperatures lie between the 45°N Spring/Fall curve and the 60°N January curve. The highest temperature profiles were for flights C-435 and C-436. The lowest temperature profile was for flight C-452. Most of the flights followed the general slope if not the magnitude of the Spring/Fall curve. Flights C-449, C-453, C-454 and C-456A and B followed the January slopes. All the temperatures are reasonable for these latitudes from 31 January to 31 March.

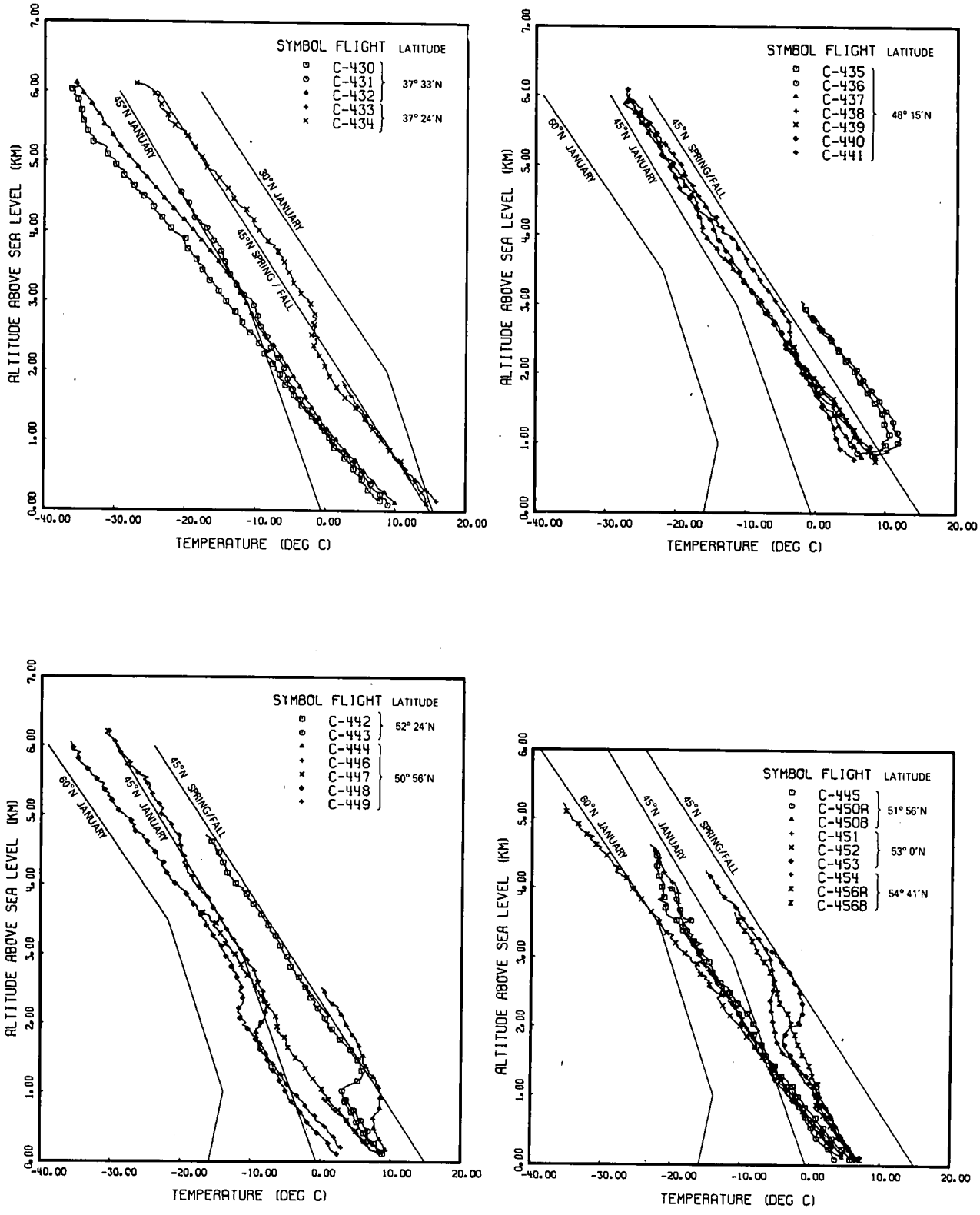


Fig. 8-1. Temperature for OPAQUE IV Flights 31 January to 31 March 1978 Compared to Temperature from U.S. Standard Atmosphere Supplements (1966).

RELATIVE HUMIDITY

Relative humidity was computed from the measured values of ambient temperature and dewpoint (or frostpoint) temperature. The dewpoint temperatures were measured using the modified Cambridge hygrometer system [Duntley, *et al.* (1972c)] and are the fifth set of data reported since the modification was completed.

The graphs of the in-flight data on relative humidity in Fig. 6-3 give a measure of the expected level of temporal and spatial variability of the relative humidity over the time interval of the flight and over the flight track distance of approximately 48 kilometers (30 miles). It is reasonable for that variability to increase over a larger time interval and at distances greater than 50 kilometers. Also moisture layers can be expected to vary slightly in altitude with horizontal space and time. Comparison of the RAOB and in-flight relative humidity values indicates that the differences are within the expected range of variability except for flight C-432 where a single RAOB relative humidity value at approximately 3 kilometers altitude is unexpectedly large for the RAOB to flight distance of 41 kilometers. However, inspection of the dewpoint temperature graph for that flight indicates that the RAOB dewpoint temperature for ~3 kilometer altitude, when converted to equivalent frostpoint temperature for comparison to the airborne frostpoint data, is within 4.4°C and 0.25 kilometers of a flight data point. This 4.4° difference is well within the average variability of 10° of the flight data frostpoint temperatures. Also the 0.25 kilometer altitude shift is not unreasonable as a moisture layer height change.

The graphs in Fig. 6-3 indicate that relative humidity is fairly stable over the time interval of the flight for flights C-436, C-439, C-446, C-450B, and C-456B. These flights vary in relative humidity no more than 15 percent at any one altitude. Nine flights had at least one altitude interval wherein relative humidity varied by more than 50 percent; these were flights C-431, C-432, C-434, C-440, C-441, C-444, C-448, C-450A and C-454.

Four flights have upper altitude data (data above 3 kilometers altitude) which seem to indicate the possibility of hysteresis problems. The data measured during ascent for Filters 2 and 4 while indicating a decreasing relative humidity with time, are higher at each given altitude than the data measured during descent for Filters 3 and 5 which indicate relative humidity increasing with time. These flights are C-430, C-432, C-434 and C-448.

However, a fifth flight C-442 also has ascent data differing from descent data but with radically different profiles with altitude (not the typical hysteresis loop on the descent data but several decreases as well as increases with time). In addition, an analysis of the appropriate entries in the flight logs indicates normal instrument performance, and an analysis of flight data in the same dewpoint temperature range, *e.g.*, flight C-449 also illustrates instances of normal performance. Thus, although these anomolous differences are larger than one normally sees in the data, it is difficult to attribute the peculiarity specifically to instrumental malfunction, and the effect may be due to conditions not yet recognized.

For the rest of the flights the general structure with altitude is usually repeated for the four profiles, but the range of values at any one altitude varied between 15 and 50 percent relative humidity.

The relationship of total volume scattering coefficient values and relative humidity will be dealt with in the next section.

8.2. AIRBORNE RADIOMETRIC DATA

TOTAL VOLUME SCATTERING COEFFICIENT

The nephelometer was known to have stray light problems during the OPAQUE I, II and III deployments which affected both the total volume scattering coefficient measurement and the volume scattering function measurement at 150°. In order to determine if the same stray light correction was applicable, the OPAQUE IV nephelometer data were subjected to the same analysis as the OPAQUE I, II and III data. This analysis is discussed on pages 8-5 through 8-12 of Duntley, *et al.* (1977), pages 8-5 through 8-7 of Duntley, *et al.* (1978a), and pages 8-5 through 8-6 of Duntley, *et al.* (1978b).

Two additional comments regarding the OPAQUE IV scattering coefficient measurements seem appropriate for inclusion at this point. First, as discussed further in the following paragraphs, the early Sicilian flights were processed differently than the subsequent northern European flights. This dual processing procedure was selected after an extensive analysis of the nephelometer data and the effects induced by a defective optical attenuator. However, as a result of this dual procedure, there may be an undefined offset in absolute value between the scattering coefficients measured in Sicily and those measured later in the deployment. As of the time of this report there are no clear evidences that this offset exists, however diagnostic studies are continuing in an effort to remove all doubt. Second, there were intermittent electronic problems encountered during this deployment which caused the nephelometer data to exhibit abnormal noise characteristics. Normally, the degree of fine structure in the nephelometer data that can be attributed to instrumentation and system noise is not more than ±5 percent of the reading. However, as illustrated by the profiles representing flight C-432, a semi-square wave biasing voltage was imposed, during some flights, upon the data signal. This distortion of the profile data is of such a nature that the erroneous values are those representing the smaller value of scattering coefficient. These distortions appear to affect only the flights in Sicily and so far no determination of their cause has been established. Users should be aware of these circumstances during their evaluation of the suitability of these data for their specific application.

Flights C-430 through C-434. The stray light error in the total volume scattering coefficient was corrected for the OPAQUE I, II and III data by subtracting out a constant error C which was separately determined for each filter. Fig. 8-2 is a graph of the measured total volume scattering coefficient versus the volume scattering function at 30° for the OPAQUE IV pseudo-photopic Filter 4 data for flights C-430 through C-434. The lower curve is again based upon the median values derived from Barteneva (1960). The upper curve is the Barteneva values if a constant error C is added to the total volume scattering coefficient for Barteneva. The constant C was derived from the OPAQUE I data. This graph indicates that the same error continues to apply to the OPAQUE IV data for flights C-430 through C-434 as expected.

Similar graphs of the data for flights C-430 through C-434 were made for the other three filters. In all cases, the stray light error is similar to the OPAQUE I error. Therefore, the same corrections were applied to these flight data as were applied to the OPAQUE I, II and III data. The measured total volume scattering coefficient was corrected by subtracting the OPAQUE I correction constants: 2.99E−5 for Filter 2 mean wavelength 478 nanometers, 2.37E−5 for Filter 4 mean wavelength 557 nanometers, 1.79E−5 for Filter 3 mean wavelength 664 nanometers, and 1.40E−5 for Filter 5 mean wavelength 765 nanometers. The total volume scattering coefficient data reported herein for flights C-430 through C-434 have been corrected by these constants.

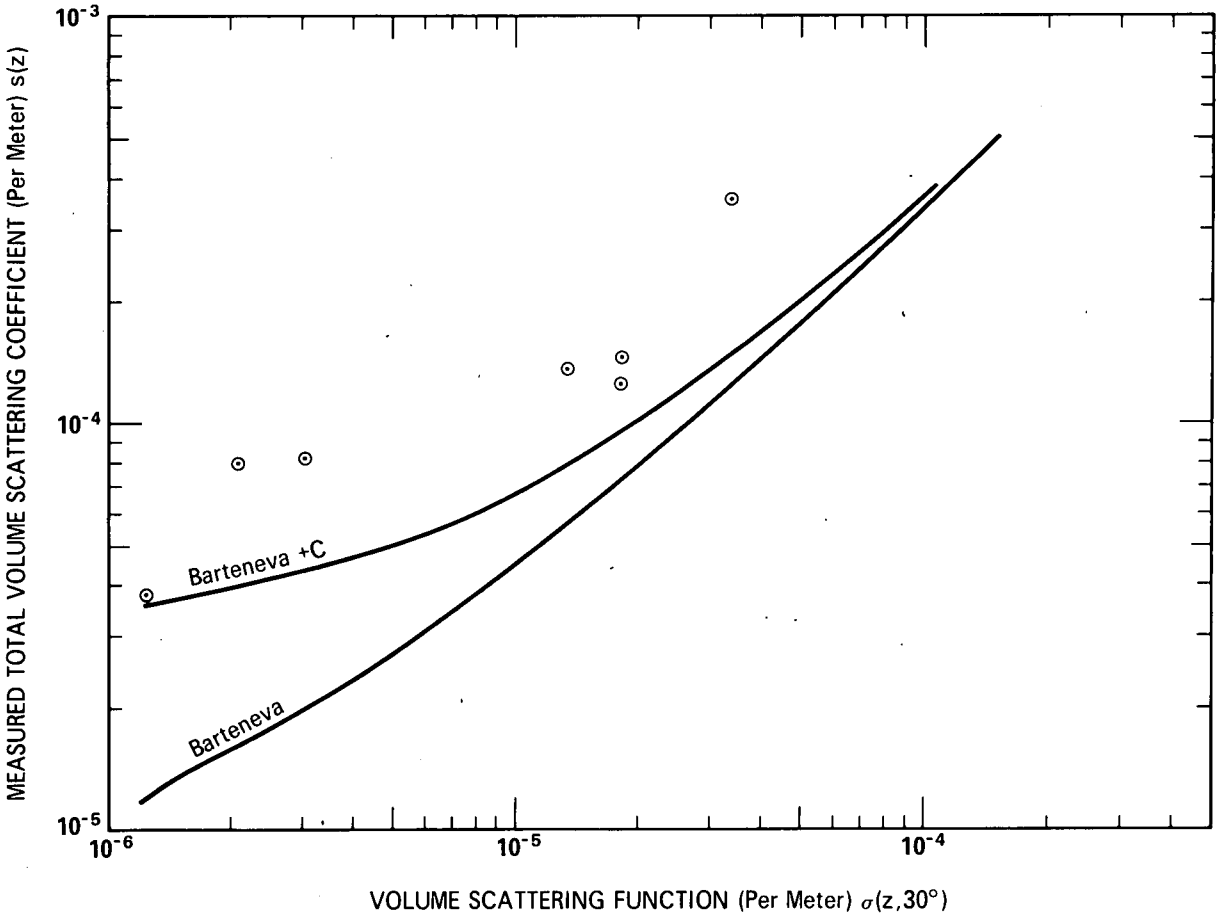


Fig. 8-2. Total Volume Scattering Coefficient Versus Volume Scattering Function at 30 Degrees for OPAQUE IV Flights C-430 through C-434, Filter 4 Pseudo Photopic Mean Wavelength 557 Nanometers, $C=2.37 \times 10^{-5}$.

Because the correction is a subtractive one, it should be noted that the scatter in the low magnitude data has been magnified, whereas the variability of the high magnitude data has been affected very little for flights C-430 through C-434.

Flights C-435 through C-456B. Between flights C-434 and C-435, a field fix involving a realignment of the airborne nephelometer detector assembly was instituted in an attempt to compensate for a misinterpreted optical attenuator defect. Thus it is appropriate to check separately the data for flights C-435 through C-456B to see if the stray light error was affected by the realignment. Fig. 8-3 is a graph of the measured total volume scattering coefficient versus the volume scattering function at 30° for the pseudo-photopic Filter 4 data for flights C-435 through C-456B. These data on total volume scattering coefficient lie below the curve with the correction constant used for the earlier flights. This indicates that the stray light error was at least partially corrected by the realignment.

Similar graphs were made for the other three filters. In all cases the stray light error was less than for OPAQUE I. Consequently, it was decided that no stray light correction would be applied to the total volume scattering data for all four filters for flights C-435 through C-456B.

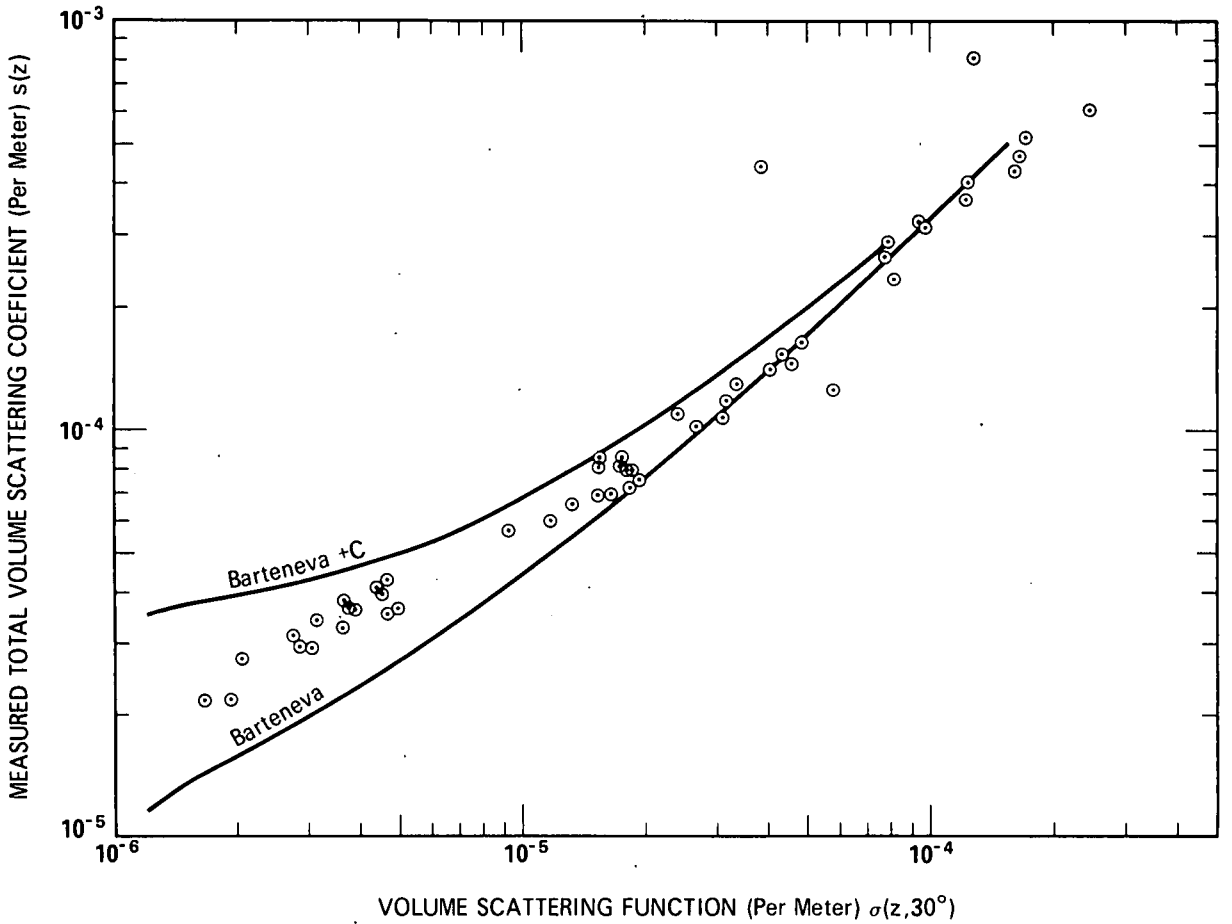


Fig. 8-3. Total Volume Scattering Coefficient Versus Volume Scattering Function at 30 Degrees for OPAQUE IV Flights C-435 through C-456B, Filter 4 Pseudo-Photopic Mean Wavelength 557 Nanometers.

General Evaluation. The data reported for total volume scattering coefficient were measured during the vertical profile flight elements. Since six different flight patterns were used during OPAQUE IV, they are summarized in Table 8.2. The first pattern listed is a (2+4) profile, two filters at four straight and level altitudes, with the vertical profile during ascent for the first filter, and during descent in the second filter. This flight pattern was illustrated in Fig. 4-1. The maximum altitude varied with the flight pattern as noted in column 3, Table 8.2. The elapsed time also varied according to flight pattern and altitude interval and these averages are given in column 4.

The data have been extrapolated upward to the nearest 300-meter altitude increment for each filter. These upward extrapolations are based upon the density ratios of the *U. S. Standard Atmosphere,* (1962) (equivalent to the 45°N Spring/Fall). The extrapolations appear on the graphs of total volume scattering coefficient as a slightly slanting dashed line. The upward extrapolations generally follow the prevailing trend of the data, and are over small altitude intervals. However, the extrapolation for the flights with upper level haze or moisture layers are somewhat suspect and should be used with caution; these include flights C-431 (Filters 4, 5), C-435 (Filter 4), C-437 (Filter 4), C-440 (Filters 2, 3, 5), C-441 (Filters 2, 3, 5), C-444, C-447, C-450A (Filters 4, 5), C-452, C-454 (Filter 5), C-456A (Filters 4, 5 due to haze layer shown for Filter 2), C-456B (Filters 3, 4, 5).

Table 8.2. Flight Patterns Used During OPAQUE IV

Pattern	Description	Maximum Altitude (meters)	Average Elapsed Time		Flights
			Hours	Minutes	
2+4	Two filters at four straight and level altitudes	~5200	3	38	C-434,C-437,C-440,C-449,C-454
2+3	Two filters at three straight and level altitudes	~3000	2	46	C-431,C-444
4+2	Four filters at two straight and level altitudes	~5200	1	43	C-432
2+2	Two filters at two straight and level altitudes	~5200	1	35	C-441
		~3000	1	27	C-435,C-450A(Filters 2,3)
		~1500	1	25	C-436,C-439,C-443,C-446, C-450B,C-456A
1+2	One filter at two straight and level altitudes	~5200	1	17	C-442,C-445(Filters 2,3), C-448,C-451,C-452(Filters 2,3)
		~3000	1	14	C-447,C-450A(Filters 4,5), C-453,C-456B
		~1500		24	C-438(Filter 2),C-445(Filters 4,5), C-452(Filters 4,5)
V-PRO	Partial or no straight and level altitudes	~5200		25	C-430
		~1500		48	C-433

For simultaneous data, the order of the scattering coefficient data by filter generally should be the inverse of the mean wavelength of the filters, *i.e.*, $s(\text{Filter } 2) > s(4) > s(3) > s(5)$. Although the data were not simultaneous, the data above 3 kilometers on the high altitude flights historically tend to follow this order except when upper level haze or moisture layers are encountered. This is generally true for flights C-435 through C-456B. However, for flights C-430 through C-434 the data for Filters 3 and 5 are roughly equal or in inverse order above 3 kilometers in altitude. On the intermediate and low altitude flights, there are sometimes clear stable areas between or above haze layers. In general, however, the OPAQUE IV flights have a great deal of structure due to the presence of haze layers at all altitudes and those layers tend to be unstable with time and/or space.

To more easily compare the scattering characteristics of the flights, the Filter 4 (pseudo-photopic) total volume scattering coefficient profiles for each flight have been graphed in Fig. 8-4. The flights are graphed by clusters of flight tracks and are in chronological order except for C-445. Two thirds of the flights were for the winter period including flight C-445 although it is graphed with the rest of the Soesterberg flights which were in early Spring. In comparing the data for the four portions of the figure it should be noted that the total volume scattering coefficients are on a slightly different scale for the Spring data due to the difference in the range of values.

Note that there is a general increase in the low altitude (0 to 1 kilometers) total volume scattering coefficients chronologically as well as an increase in the general complexity of the low altitude profiles chronologically, with the first two winter graphs being lower in range and less complex than the late Winter and early Spring graphs in Fig. 8-4.

Clear layers above 3 kilometers have been noted for many of the flights during all the OPAQUE deployments. A comparison of the range of total volume scattering coefficient values during each OPAQUE deployment is given in Table 8.3. The four categories for OPAQUE IV correspond to the four parts of Fig. 8-4. The clearest and the least clear stable upper altitude layers for OPAQUE IV (exclusive of haze or moisture layers) were encountered in Sicily during flights C-432 and C-434 respectively. All the remaining clear upper altitude OPAQUE IV data fall in that range. The overall range for OPAQUE IV upper altitude data is similar to the range for the OPAQUE I and II data.

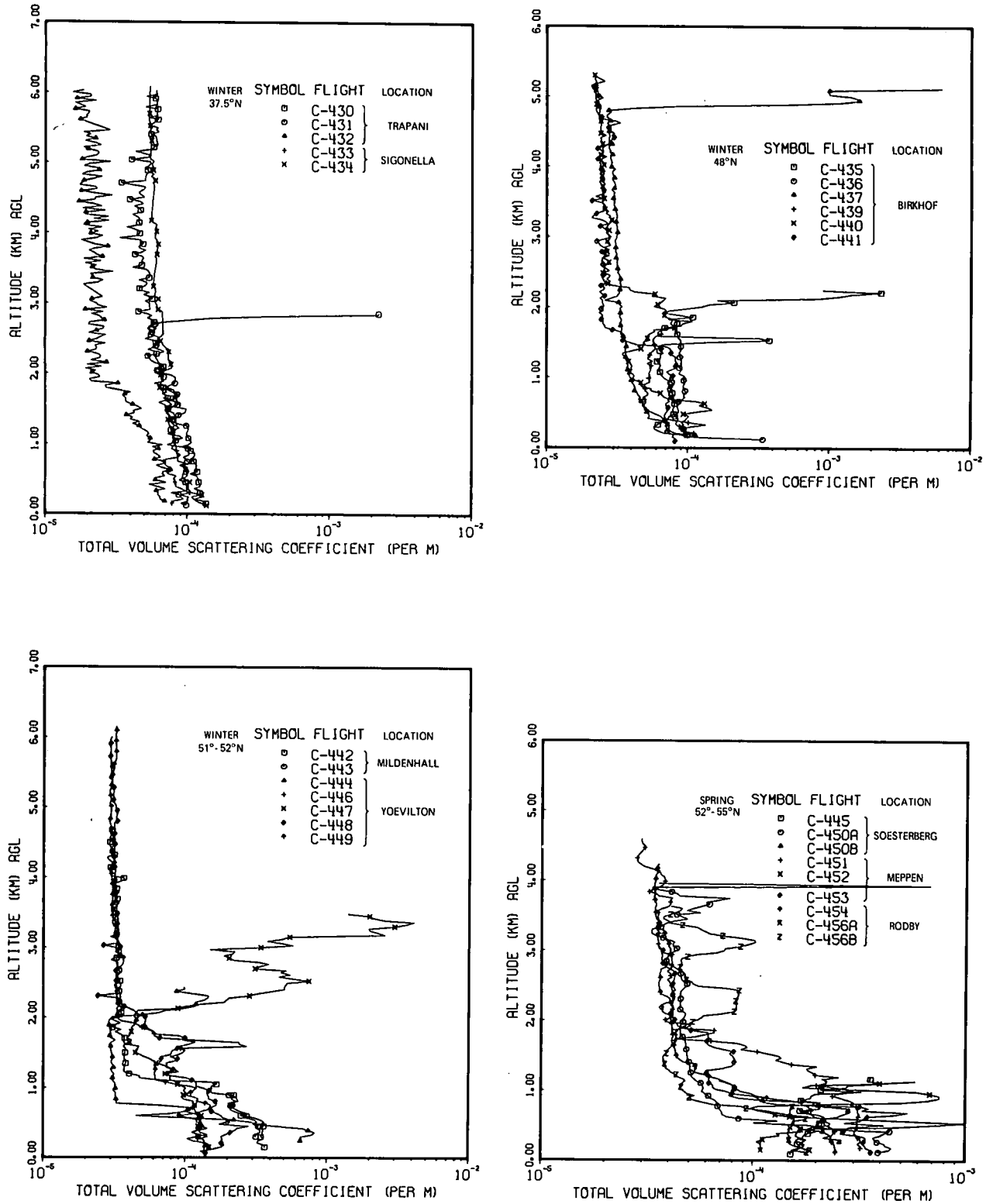


Fig. 8-4. Total Volume Scattering Coefficient for Filter 4 Pseudo-Photopic for OPAQUE IV Flights 31 January through 31 March 1978.

Table 8.3. Comparison of the Clear Layer Upper Altitude Total Volume Scattering Coefficients for Filter 4 Mean Wavelength 557 nm

OPAQUE Data Set	Season	Approximate Latitude (degrees)	Total Volume Scattering Coefficient (m^{-1})	
			Minimum	Maximum
I	Spring	51°N - 55°N	1.2E−5	7.0E−5
II	Fall	48°N - 55°N	1.2E−5	7.0E−5
III Jul	Summer	48°N - 55°N	2.0E−5	6.0E−5
Aug	Summer	53°N - 55°N	4.0E−5	1.2E−4
IV	Winter	37°N	1.6E−5	6.5E−5
	Winter	48°N	2.2E−5	3.3E−5
	Winter	51°N - 52°N	3.0E−5	3.5E−5
	Spring	52°N - 55°N	2.9E−5	5.0E−5

Low Altitude Data. The total volume scattering coefficient data in the lower altitudes tend to be substantially more complex than the data measured at higher altitudes. This complexity is particularly evident in the regime below about 1.5 to 2.0 kilometers. In this region there are often one or more distinct haze layers, in addition to spectral irregularities seldom found at the higher altitudes. To illustrate the typical complexities found in these low altitude data the total volume scattering coefficient profiles for all twenty six OPAQUE IV flights were replotted on an expanded vertical scale. From these, the twelve flights shown in Figs. 8-5, 8-6, and 8-7, were chosen for display as typical of the general low altitude classifications listed in Table 8.4.

The classifications listed in Table 8.4 are of course quite broad but in general sort the profile data into several general sets. These sets range from the Type I unstructured and neatly spectrally ordered profiles used in many modelling approximations, to the Type IV strongly structured and spectrally cluttered profiles indicative of highly non-uniform and unstable aerosol conditions.

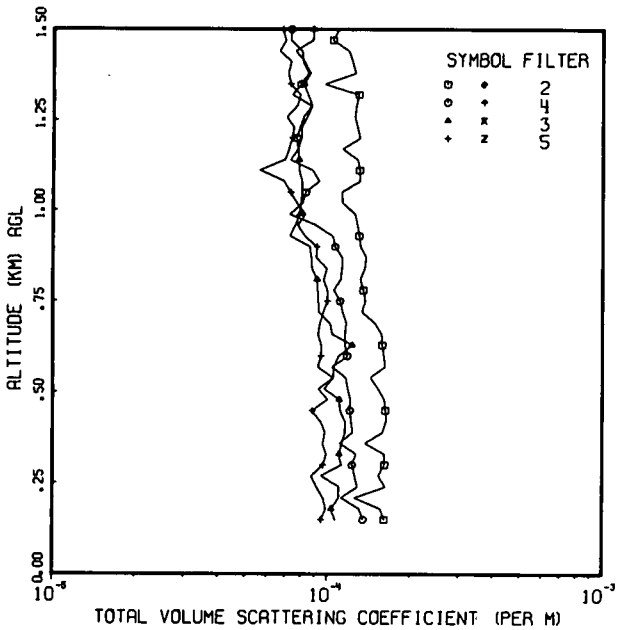
Table 8.4. Preliminary Classification of Low Altitude Scattering Coefficient Profiles

Classification	Class Description	Flight No.	Cumulative OPAQUE I thru IV
Type I	No large, abrupt haze layer No spectral cross-over between profiles	NONE	4
Type II	No large, abrupt haze layer Numerous spectral cross-overs between profiles	430 437 431 441 432 446 433 447 434 451 435 456A	23
Type III	Moderately abrupt haze layer Numerous spectral cross-overs between profiles	436 450B 439 452 440 454 443 445 449	23
Type IV	Large, abrupt haze layer Numerous spectral cross-overs between profiles	442 450A 444 453 448 456B	9

FLIGHT C-430

TRAPANI

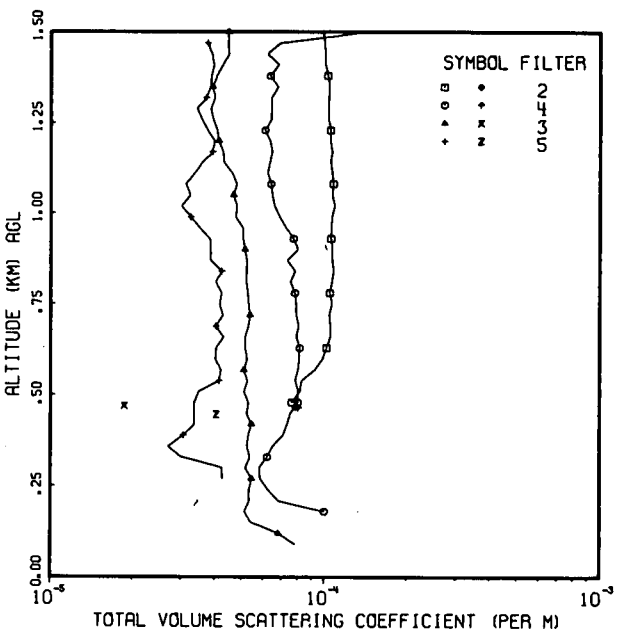
Type II



FLIGHT C-435

BIRKHOF

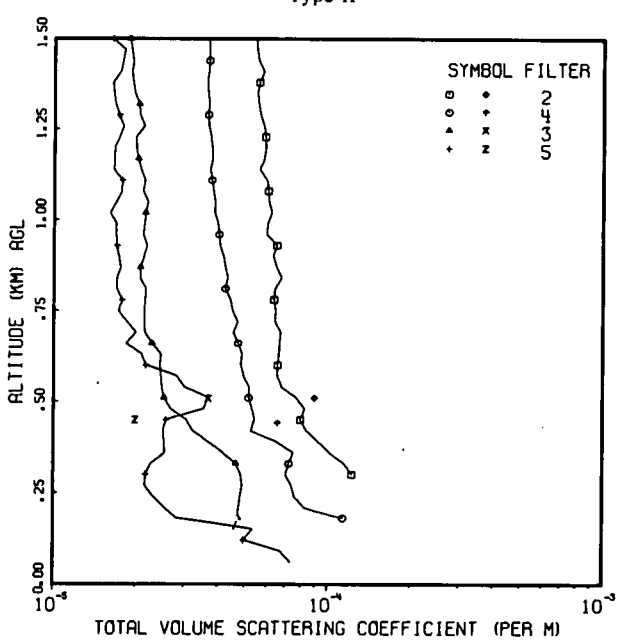
Type II



FLIGHT C-437

BIRKHOF

Type II



FLIGHT C-447

YEOVILTON

Type II

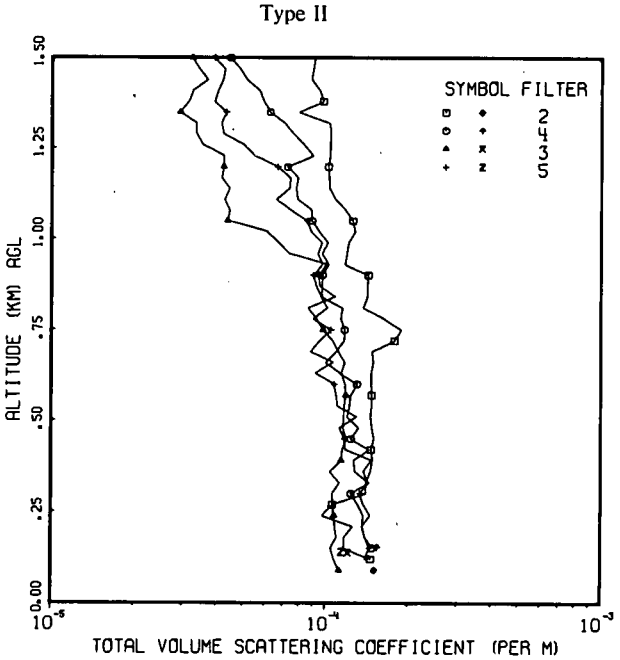
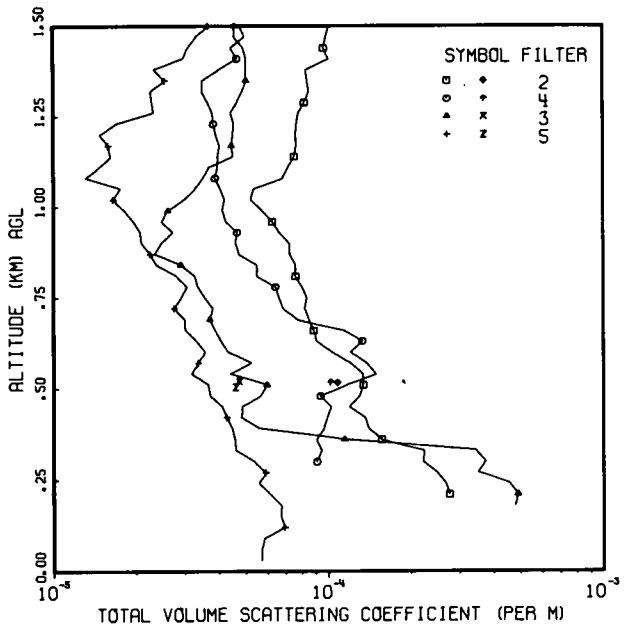


Fig. 8-5. Low altitude total volume scattering coefficients for Type II profiles.

FLIGHT C-440

BIRKHOF

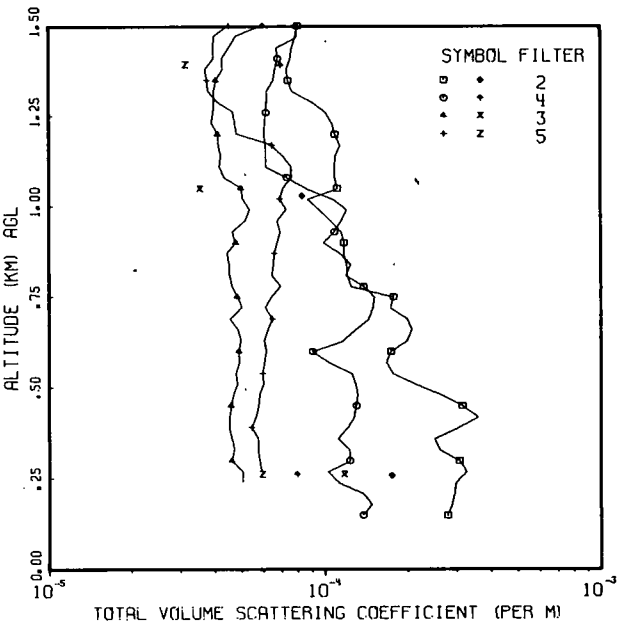
Type III



FLIGHT C-449

YEOVILTON

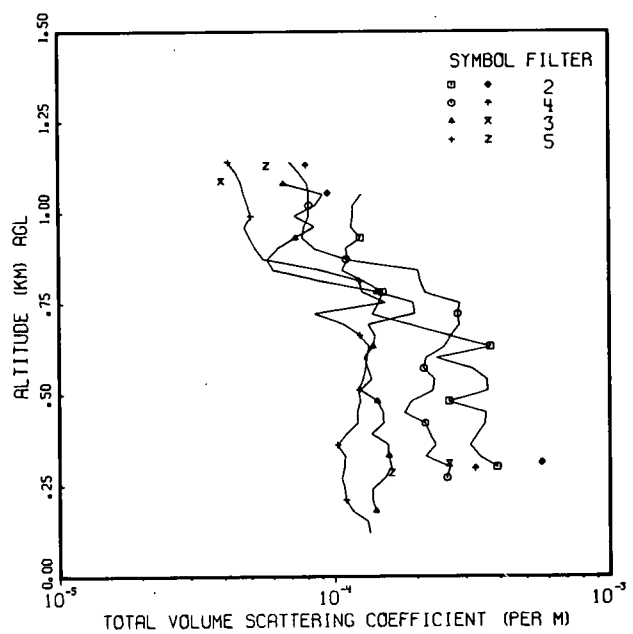
Type III



FLIGHT C-450B

SOESTERBERG

Type III



FLIGHT C-454

RODBY

Type III

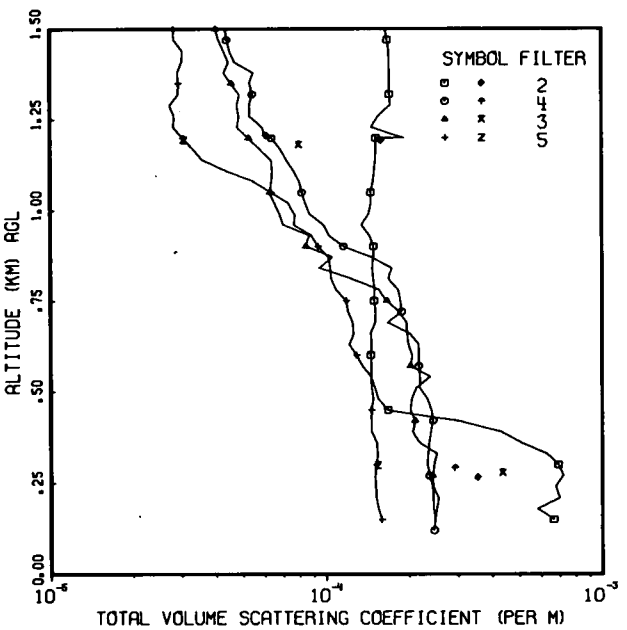
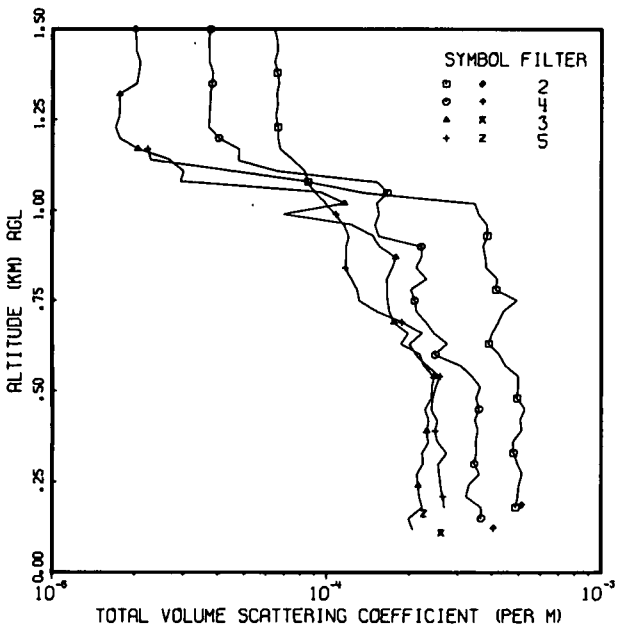


Fig. 8-6. Low altitude total volume scattering coefficients for Type III profiles.

FLIGHT C-442

MILDENHALL

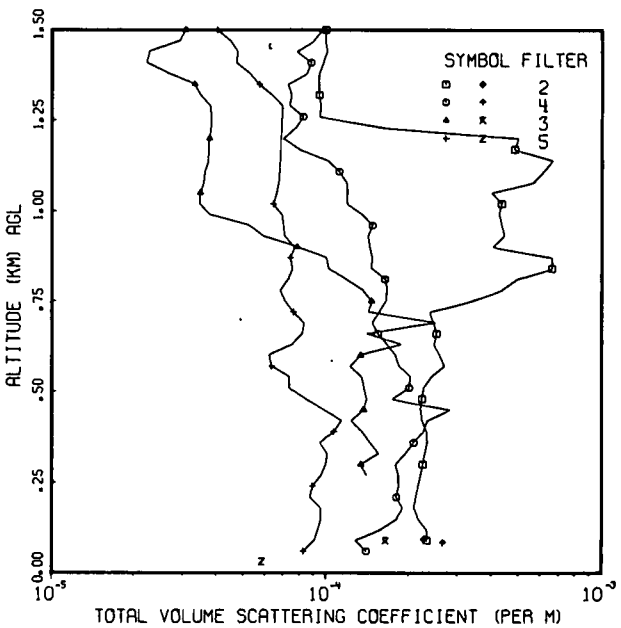
Type IV



FLIGHT C-448

YEOVILTON

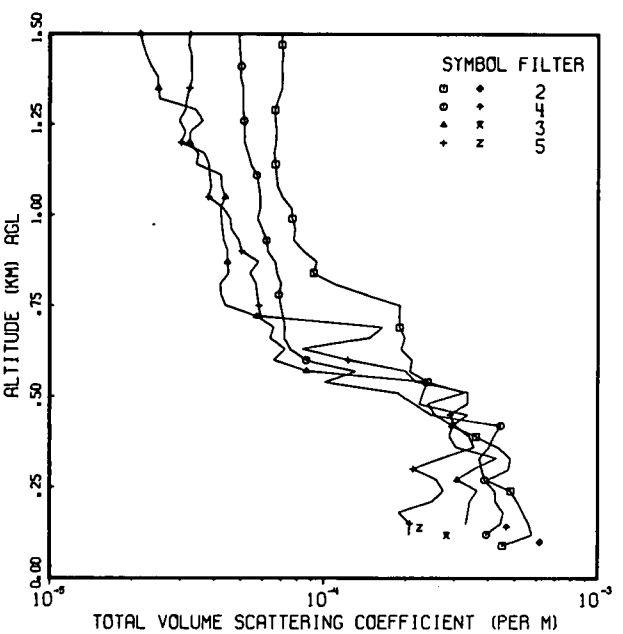
Type IV



FLIGHT C-450A

SOESTERBERG

Type IV



FLIGHT C-456B

RODBY

Type IV

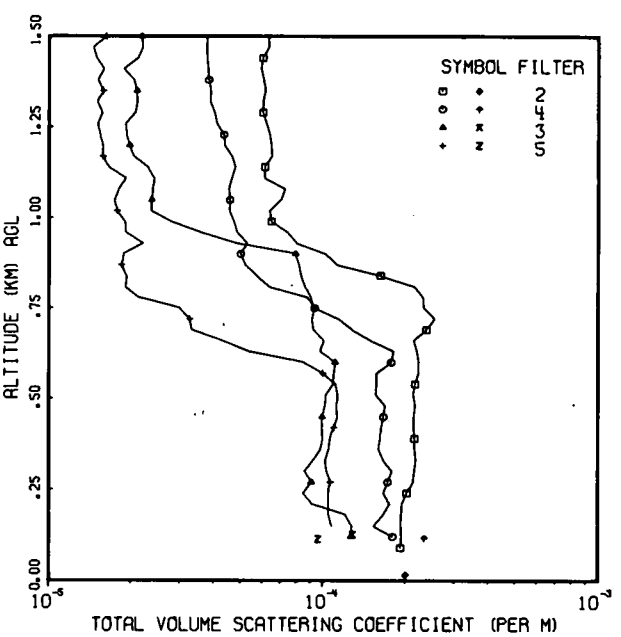


Fig. 8-7. Low altitude total volume scattering coefficients for Type IV profiles.

The distribution of the profile data within these general classifications becomes particularly significant whenever the data application involves inclined lines of sight contained within this low altitude regime. The erroneous assumption that the low level atmosphere is always a well behaved Type I environment may easily result in the computation of severely misleading values of path radiance and/or contrast transmittance.

It is interesting to note that even though the OPAQUE IV deployment contains twenty six flights, nearly as many as the three preceding deployments combined, there were no well defined Type I profiles within the set. The Type II profiles representing flights C-435 and C-437 are the closest, but neither is as well behaved as C-395 in the OPAQUE II set, or C-416 in the OPAQUE III set. The cumulative occurrence of each of the four types of low altitude profiles during the first four OPAQUE deployments is listed in the right hand column of Table 8.4.

Whenever the measurements at the lowest altitude indicate some irregularity, such as being out of the anticipated spectral order, *i.e.* not varying inversely with wavelength as illustrated by flight C-440, then any downward extrapolation of the data will reflect a continuation of this offset. Since both the equivalent attenuation length and the beam transmittance are calculated between ground level and altitude, they are greatly influenced by these low altitude extrapolations, and thus will also reflect these spectral irregularities as illustrated in the plots of Section 7.

Users should be aware that the profiles illustrated in Section 7 and in Figs. 8-5, 8-6 and 8-7 are both measured over a several hour period of time and over a 48 kilometer flight track, and thus the spectral and structural irregularities between them can be considered measures of the temporal and geographical non-uniformity of the aerosol.

The general classifications of Table 8.4 can also be used to sort the characteristics of the full 6 kilometer profiles illustrated in Section 7. Such classifications would help to define the optical stability and structural characteristics of the larger ground level to 6 kilometers environmental sample. This overall structural classification of the entire OPAQUE data set is currently in progress, and is scheduled for inclusion in the OPAQUE V technical report.

Ground Level Data. Ground level measurements of total volume scattering coefficient were made from 3 to 18 February in Sicily, from 27 February to 3 March at Birkhof, Germany, from 9 to 17 March at Yeovilton, England and 22 to 31 March at Meppen, Germany. Eleven of these data sets were both concurrent with and near the flight track of thirteen of the 26 flights reported herein. These measurements are not stored in automatic form, however, so this laborious data reduction will be done later, during the processing for obtaining the directional path reflectance for an ensuing report.

Extrapolations Downward to Ground Level. All the total volume scattering coefficient data have been extrapolated from the lowest altitude measurement down to ground level. The extrapolations downward to ground level were based upon the density ratios of the *U. S. Standard Atmosphere,* (1962). All the downward extrapolations appear on the graphs of total volume scattering coefficient in Section 7-3 as dashed lines.

On all but one of the vertical profiles (flight C-435, Filter 2) it was possible to make airborne measurements as low as 330 meters, and occasionally as low as 30 to 60 meters. Therefore all these downward extrapolations are for relatively small altitude intervals. The Filter 2 flight C-435 extrapolation downward from 480 meters is suspect since there is evidence of a very low altitude haze layer in the profiles for Filters 3 and 4.

Comparison to Visibility. The meteorological estimates of horizontal visibility VV have been related to the attenuation coefficient α by Douglas and Young (1945), and hence may be related to the scattering coefficient in the absence of absorption by

$$VV = \ln 18/\alpha \approx 3/s \ . \tag{8.1}$$

An additional discussion of this relationship is presented by Middleton (1952). Visibility values for the lowest altitude vertical profile flight element based on Eq. (8.1) are given in column 5 of Table 8.5. The airborne visibilities lie close to (± 2 kilometers) or within the span of the most appropriate weather station visibilities for all but flights C-430 through C-434, C-442 and C-451.

It should be noted that the data from flights C-430 through C-434 have been processed differently than the subsequent flights due to the attenuator defect discovered during the flights made in Sicily. Consequently, there is some degree of additional uncertainty that must be associated with the absolute values of scattering coefficient measured on these flights. There are no reasons to suspect the general structure of the profiles however, and further evaluation of the measured absolute values is continuing.

Composite Graphs of RH and s. A qualitative though informative comparison of the relative humidity and the total volume scattering coefficient measurements taken during the vertical profile flight elements may be made by examining the graphical displays of relative humidity in Section 6.1 and total volume scattering coefficient in Section 7.3.

A convenient method of assessing the degree of similarity, or the lack thereof, between the relative humidity profiles presented in Fig. 6-3 and the total volume scattering coefficient profiles presented in Section 7, is to use the composite plots illustrated in Fig. 8-8. In these automatically generated overlays one can readily determine the degree to which the two plots exhibit the same or similar structural characteristics. These paired plots of simultaneously recorded data sets represent an optional display form and are proving useful in guiding the analyst toward the goal of determining a more clearly defined relationship between the measured optical and meteorological properties of the atmosphere. The increased use of these displays is accelerating our ability to select flights whose optical and meteorological characteristics are thoroughly enough documented to enable their use in firmly establishing their linking relationships.

The examples shown in Fig. 8-8 were selected from twenty-seven pairs of profile data measured during the OPAQUE IV Filter 4 pseudo-photopic ascents. These graphs were chosen to illustrate high structural similarity throughout the total altitude interval (C-456B), intermediate structural similarity (C-430 and C-442) and a low structural similarity (C-437).

Correlation with Relative Humidity. An attempt was made to correlate the total volume scattering coefficient for Filter 4 (pseudo-photopic) with the relative humidity for the SEEKVAL data [Duntley, *et al.* (1975a)]. These data indicated an approximately linear relationship between the log of the ratio of the total volume scattering coefficient to the Rayleigh total volume scattering coefficient, $s(z)/_R s(z)$, and the relative humidity RH

$$\log s(z)/_R s(z) = 1.28\frac{RH}{100} . \tag{8.2}$$

This was for a flight track in western Washington over forest near an agricultural area, removed from major sources of industrial pollution and auto emissions.

Table 8.5. Low Altitude Visibility Based on Nephelometer Compared to Meteorological Estimates from Weather Stations

Track Location	Flight No.	Time (GMT)	Altitude (m)	Visibility (kilometers)				
				Airborne Nephelometer	Weather Stations & Distance from Track Center			
					Trapani (41 km)	Pantelleria (94 km)		
Trapani	C-430	1536	150	22	11.2	11.2		
	C-431	1232	120	30	11.2	11.2-20		
	C-432	1229	180	43	7-9	11.2		
					Trapani (254 km)	Pantelleria (304 km)		
Sigonella	C-433	1236	150	38	7.0	7-11.2		
	C-434	1149	120	22	9.0	6-7		
					Spaichinger (28 km)	Freudenstad (53 km)	Ulm (68 km)	
Birkhof	C-435	941	180	30	70-75	30-40	0	
			210	44	70-75	30-40	0	
	C-436	1426	120	8.8	60	40-45	4.8-5	
			180	33	60	40-45	4.8-5	
	C-437	1153	180	26	70-75	40	0.8-9	
	C-439	1352	210	27	60-70	60-65	0.8-1.8	
	C-440	1116	300	33	50-60	40-45	3.2-6	
	C-441	1560	90	37	70	70-75	15	
					Boscombe Down (273 km)	Bournemouth H (302 km)	Yeovilton (336 km)	Mildenhall (80.4)
Mildenhall	C-442	1330	150	8.2	18	18	12	11.2
	C-443	1511	300	9.5	15	11.2-15	10	11.2
					Yeovilton (15 km)	Bournemouth H (46 km)	Boscombe D (55 km)	
Yeovilton	C-444	1432	240	4.6	4.0	4.5-4.7	6-9	
	C-446	1216	270	24	8-15	11.2-15	25	
	C-447	1347	150	20	8-12	11.2-15	25	
	C-448	1214	60	21	14	13-15	30	
	C-449	1139	150	22	12-14	18-25	25	
					Deelen (26 km)	Soesterberg (30 km)	DeBilt (32 km)	
Soesterberg	C-445	1156	90	20	12-18	8-11.2	15-20	
	C-450A	1026	120	7.7	10-15	11.2-15	5-7	
	C-450B	1201	270	12	15	16	10	
					Emden (46 km)	Osnabruck (89 km)	Munster (115 km)	Bergen (149 km)
Meppen	C-451	1346	180	9.3	15	20-25	25	20-25
	C-452	1520	150	28	8-17	40	35-40	35
	C-453	920	120	8.3	7	12	15	15
					Fehmarnbelt (10 km)	Gedser Rev (74 km)	Kegnaes (75 km)	
Rodby	C-454	1229	120	12	10	4.5-6	7	
	C-456A	1357	150	16	10	22	15	
	C-456B	1505	120	17	10	22	15	

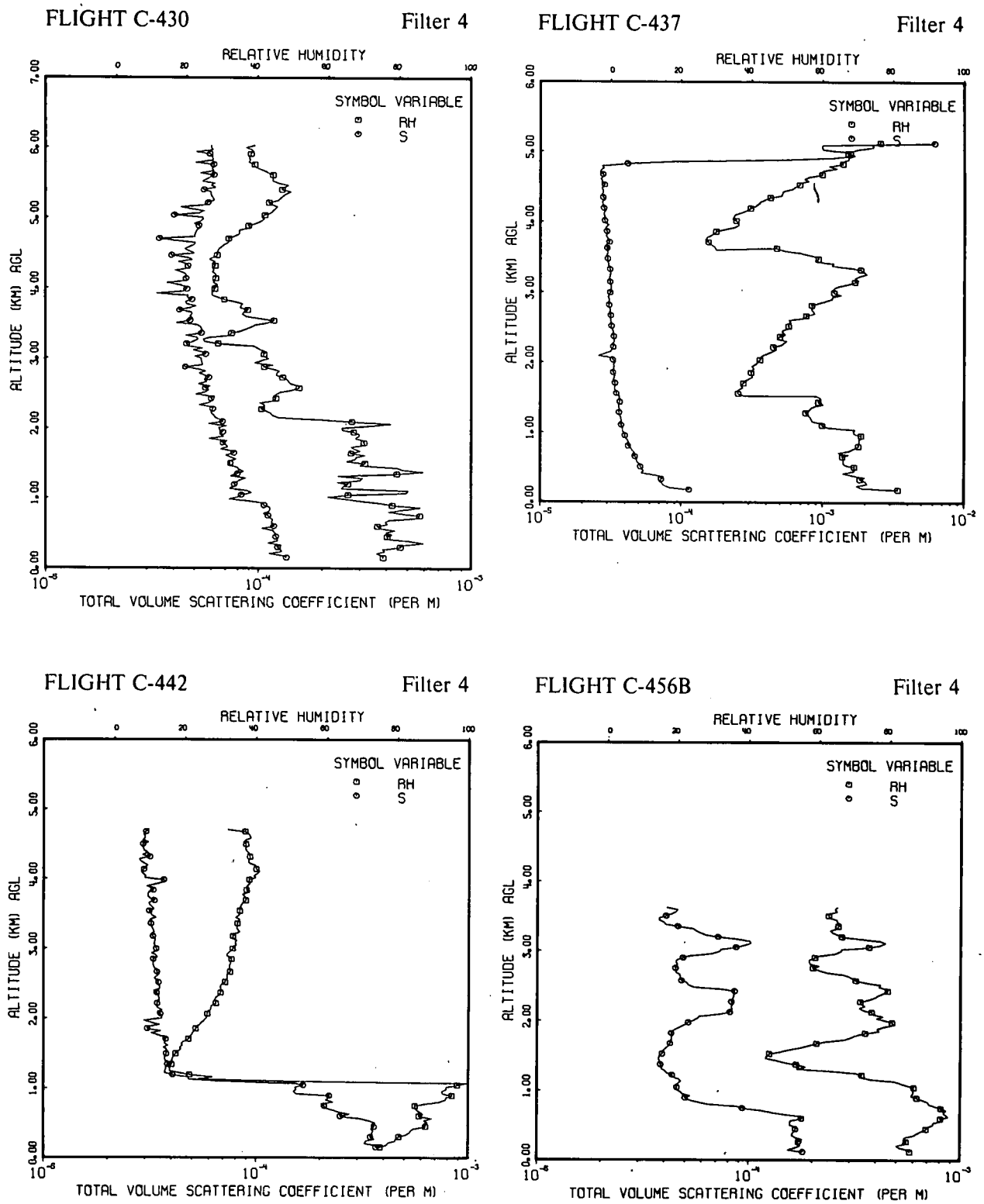


Fig. 8-8. Comparison of the Photopic Scattering Coefficient and Relative Humidity Profiles as Measured During Flights C-430, C-437, C-442 and C-456B.

Although the data from the earlier three OPAQUE deployments failed to illustrate this same linear relationship, the OPAQUE IV data have been plotted in a similar manner to provide a consistent format for comparison. Thus, the nephelometer data from the vertical profile flight elements have been put into ratio form and graphed as a function of relative humidity in Fig. 8-9 for the same flights as Fig. 8-8. The superimposed line is for the relationship indicated by Eq. (8.2) for the SEEKVAL data.

In general, Eq. (8.2) is not valid for the sample OPAQUE IV data in Fig. 8-9. The data for flight C-430 clearly follow a lower slope for all filters; also, the Filter 4 intercept is closer to ${}_{S}/_{R}s=5$ not 1. For C-437 the mass of data indicate a zero or a slightly negative slope, and the scattered high values for Filter 4 are the data values from the high altitude moisture layer where the high total volume scattering coefficients were paralled by high vertical path function values, but not by high relative humidities. The overall data for C-442 indicate a seemingly similar slope to the SEEKVAL curve, but if the high and low altitude data are viewed as separate data sets, they indicate lower slopes for the high altitude data (at low relative humidities) and a large scatter in the low altitude data. The C-456B data indicate a fair correlation except for the high ratios for the high altitude Filter 2 haze layer. Superposition of the data for one spectral filter upon the next makes it difficult to see the characteristics of each data set clearly. Thus an alternate, spectrally selective display option is being developed.

Mie Volume Scattering and Absolute Humidity. The Mie volume scattering coefficient ${}_{M}s(z)$ is the total volume scattering coefficient less the Rayleigh scattering coefficient ${}_{R}s(z)$

$$ {}_{M}s(z) = s(z) - {}_{R}s(z) \ . \tag{8.3} $$

The absolute humidity AH (or density of water vapor ρ_w) is computed from the measured ambient temperature t and the dewpoint (or frostpoint) temperature t_d from the equation

$$ AH = \rho_w = \frac{{}_{s}P(t_d)\ M_w}{83.1432(t+273.15^{\circ})} \ , \tag{8.4} $$

where ${}_{s}P(t_d)$ is the saturated vapor pressure at dewpoint temperature and M_w is the mass per mol of water which equals 18.01534g/mol. Graphs of the Mie volume scattering coefficient as a function of the absolute humidity for the same flights as Figs. 8-8 and 8-9 are given in Fig. 8-10. The graphs cannot be easily intercompared visually since each graph is scaled slightly differently. Beware especially of comparing the two log with the three log scale graphs.

The Mie volume scattering coefficient increases gradually with the absolute humidity for flight C-430; the Filter 4 data show more scatter than for the other filters. Except for the few high values for Filter 4 from the high altitude haze layer, the Mie volume scattering coefficient is a very tight increasing function of the absolute humidity for flight C-437, and the data for the three filters measured for the full altitude range, separate nicely. The shape of the function for C-437 is slightly flatter and lower at low absolute humidity than for flight C-430, and the function increases more sharply at the higher absolute humidities above 4E−3 kilograms per cubic meter. The shape of the function for flight C-442 is similar to that of flight C-437 except that it rises at a lower absolute humidity between 1 and 2E−3 kilograms per cubic meter, and includes some very high Mie scattering coefficients from the low altitude data. The data for C-456B show a much larger scatter, with the very high Mie values for Filter 5 from the high altitude haze layer showing quite clearly.

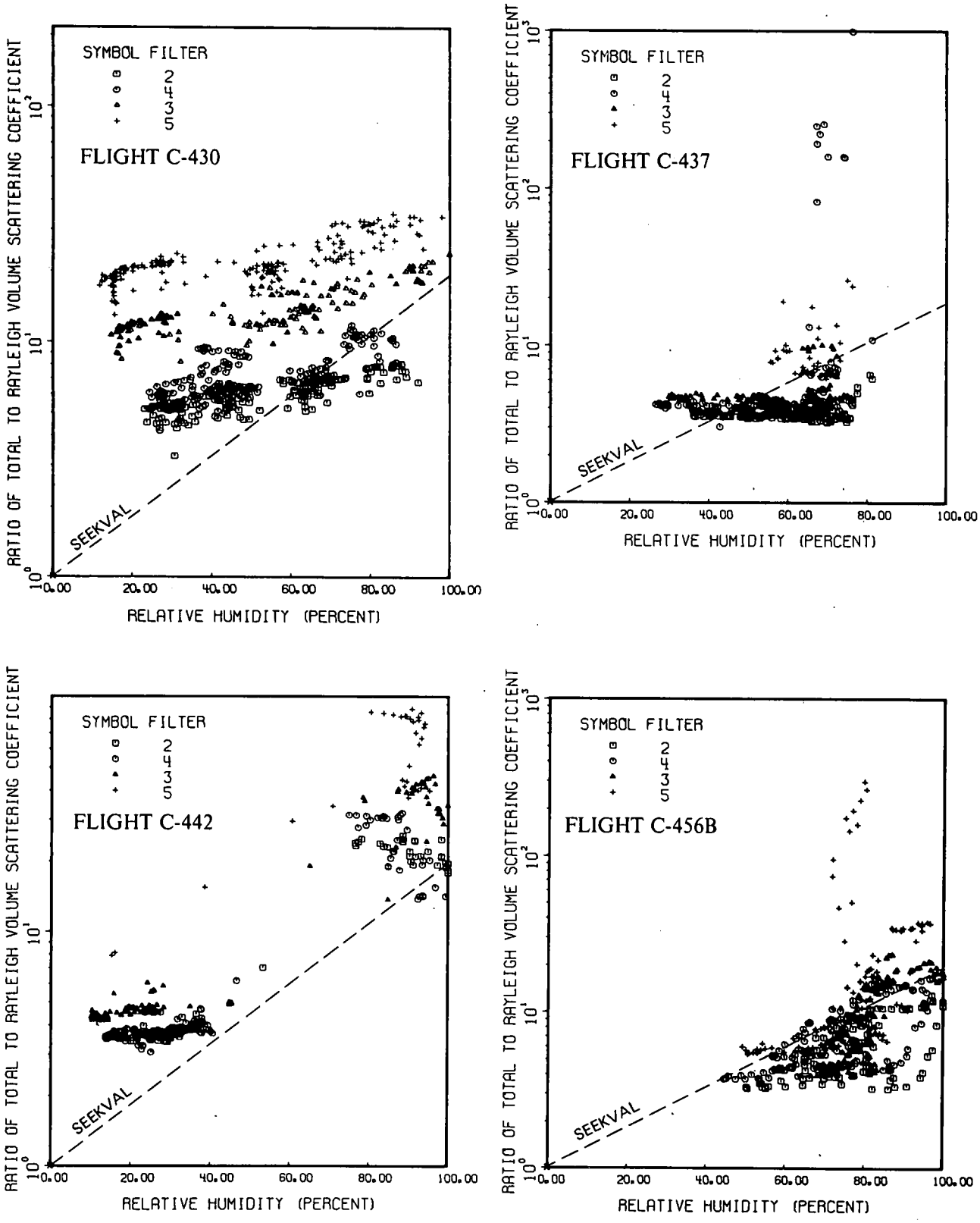


Fig. 8-9. Ratio of Total to Rayleigh Total Volume Scattering Coefficient as a Function of Relative Humidity for Flights C-430, C-437, C-442 and C-456B.

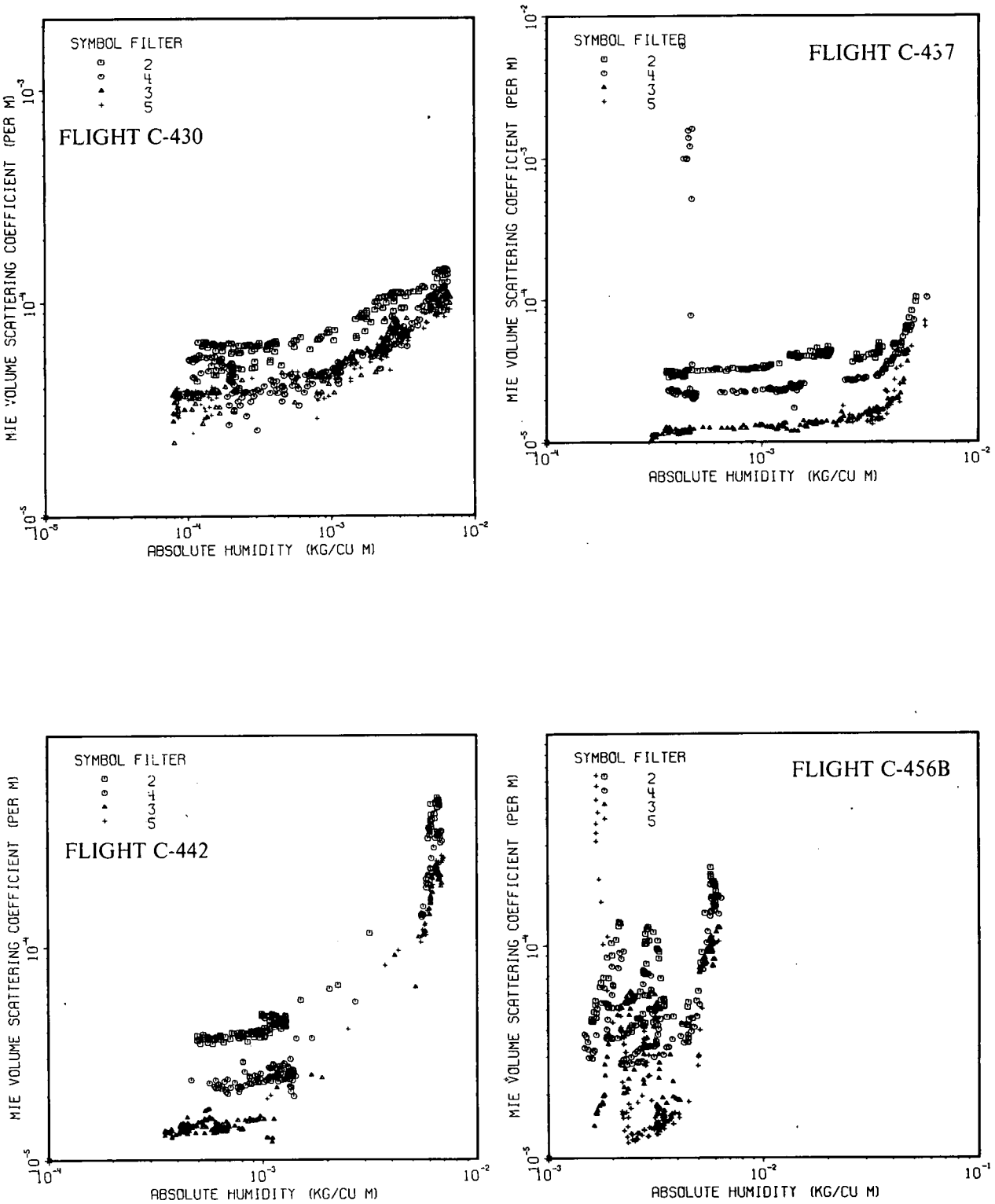


Fig. 8-10. Mie Volume Scattering Coefficient as a Function of Absolute Humidity for Flights C-430, C-437, C-442 and C-456B.

EQUIVALENT ATTENUATION LENGTH AND BEAM TRANSMITTANCE

Equivalent attenuation length is presented for the path between ground level and altitude. At ground level the equivalent attenuation length is the reciprocal of the total scattering coefficient $s(z)$. As altitude increases, the equivalent attenuation length shows the cumulative effect of summing $s(z)$ from ground level to altitude z.

The vertical beam transmittance starts at 1.0 at ground level and shows the cumulative effect of the summation of the total scattering coefficient with altitude.

For simultaneous data, or even for sequentially sampled data under reasonably stable and uniform aerosol conditions, the order by filter of the equivalent attenuaton length $\bar{L}$ and the beam transmittance should vary directly as the mean wavelength of the filters, i.e., $\bar{L}(\text{Filter 2}) < \bar{L}(4) < \bar{L}(3) < \bar{L}(5)$. Seven of the flights show this regularity at all altitudes (C-430, C-444, C-446, C-448, C-450B and C-451) and ten of the flights have attenuation length in order by filter at most altitudes (C-435, C-437, C-439, C-442, C-445, C-450A, C-452, C-453, C-454 and C-456B. Five flights are irregular at all altitudes (C-432, C-434, C-440, C-441 and C-447.

Equivalent Attenuation Length and Beam Transmittance Examples. The equivalent attenuation length table can easily be used in Eq. (2.6) to obtain beam transmittance for various zenith angles for the upward path of sight and for various zenith angles for the downward path of sight.

EXAMPLES

A. For an upward path of sight at 60-degree zenith angle, with an object altitude z_t at 4500 meters, Eq. (2.6) would be written

$$T_{9000}(0, 60^\circ) = \exp\left\{\left[-4500\text{m}/\bar{L}(4500)\right]\sec 60^\circ\right\} .$$

Using the equivalent attenuation length for flight C-442 Filter 4, Eq. (2.6) becomes

$$T_{9000}(0, 60^\circ) = \exp\left\{\left[-4500\text{m}/10,600\text{m}\right]2\right\} = 0.428 .$$

B. For a downward path of sight at a zenith angle of 105 degrees from a sensor altitude of 3000 meters, Eq. (2.6) would become

$$T_{11,590}(3000, 105°) = \exp\left\{\left[-3000\text{m}/\bar{L}(3000)\right]|\sec 105°|\right\}.$$

Again using the values from flight C-442 Filter 4, Eq. (2.6) becomes

$$T_{11,590}(3000, 105°) = \exp\left\{\left[-3000\text{m}/7960\text{m}\right]3.864\right\} = 0.233\ .$$

IRRADIANCE

Downwelling. The downwelling irradiance was measured during the straight and level flight elements and during the vertical profiles on each flight. During the straight and level flight elements, the intended aircraft flight attitude was 2.5 degrees nose high and the dual irradiometer was oriented to be horizontal during a +2.5 degree pitch. The pitch and roll measurements during the straight and level flight elements indicated that average aircraft attitude was such that the dual irradiometer was within ±4 degrees of true horizontal during most of the flights. Downwelling irradiance values for the straight and level flight elements for each flight are presented in columns 7 through 10 in Table 8.6.

Table 8.6. Downwelling Irradiance Measured by Dual Irradiometer During Straight and Level Flight Elements

Flight No.	Average Altitude (meters)	Sun Zenith Angle (Degrees)				Downwelling Irradiance($w/m^2\mu m$)				Downwelling Irradiance/ Irradiance from Brown			
		Filter 2	Filter 4	Filter 3	Filter 5	Filter 2	Filter 4	Filter 3	Filter 5	Filter 2	Filter 4	Filter 3	Filter 5
C-431	2800	54.7	60.6	54.7	-	973	348	659	-	1.23	.55	.83	-
	1510	54.9	57.7	54.8	-	1030	451	689	-	1.31	.63	.87	-
	268	56.2	56.1	55.9	-	369	423	217	-	.49	.56	.28	-
C-432	6053	63.8	64.1	64.0	-	726	614	466	-	1.35	1.16	.87	-
	121	60.4	60.6	60.5	-	107	300	235	-	.17	.48	.37	-
C-434*	6119	49.3	54.4	49.2	55.0	1100	810	755	461	1.17	1.01	.80	.59
	3079	50.3	51.7	50.1	52.1	1070	847	795	475	1.17	.97	.87	.55
	1574	51.7	50.3	51.3	50.6	1050	926	745	502	1.20	1.02	.84	.56
	294	54.7	49.3	53.2	49.4	868	500	621	492	1.09	.53	.75	.53
C-435	2200	67.9	62.6	67.0	62.1	359	298	294	233	.84	.52	.65	.40
	462	71.0	64.8	70.6	64.4	287	355	232	201	.82	.69	.64	.38
C-436	1921	64.7	70.2	65.0	70.6	211	125	154	104	.41	.34	.30	.29
	432	62.5	67.4	62.8	67.8	322	241	238	139	.56	.56	.42	.32
C-437*	5005	57.2	59.6	57.0	60.0	766	681	587	349	1.05	1.03	.80	.54
	3051	58.4	58.0	58.1	58.2	880	675	553	488	1.27	.96	.79	.70
	1536	60.3	57.0	59.9	57.1	769	691	528	468	1.20	.94	.81	.64
	477	63.6	56.6	63.1	56.6	727	252	486	279	1.33	.34	.87	.38
C-438	1620	62.8	-	-	-	752	-	-	-	1.32	-	-	-
	470	65.3	-	-	-	683	-	-	-	1.37	-	-	-
C-439	1618	59.3	64.4	59.7	65.0	453	346	302	178	.68	.66	.46	.35
	520	61.9	67.4	62.3	68.0	470	298	231	176	.79	.67	.40	.41
C-440	4719	66.2	56.3	67.0	56.6	352	751	252	597	.74	1.00	.56	.80
	3021	63.0	55.6	63.5	55.7	376	545	273	433	.67	.71	.50	.57
	1699	60.6	55.5	61.0	55.5	454	818	340	446	.72	1.06	.55	.58
	514	58.4	56.1	58.8	55.9	380	741	379	419	.55	.98	.56	.55
C-441	5261	75.6	83.2	75.7	83.4	435	124	296	79.3	1.80	1.32	1.23	.88
	92	71.7	79.0	71.9	79.2	341	57.3	394	29.0	1.02	.34	1.19	.17
C-442	4670	58.2	60.8	58.2	60.9	761	550	824	415	1.09	.88	1.18	.67
	145	57.5	59.3	59.2	62.3	596	575	469	354	.83	.86	.70	.61
C-443	911	65.2	70.1	65.7	70.9	615	486	367	200	1.23	1.30	.75	.56
	314	63.1	67.9	63.5	68.4	659	427	407	273	1.18	1.00	.74	.66

*No pitch and roll information available.

Table 8.6. (Cont'd) Downwelling Irradiance Measured by Dual Irradiometer During Straight and Level Flight Elements

Flight No.	Average Altitude (meters)	Sun Zenith Angle (Degrees)				Downwelling Irradiance($w/m^2\mu m$)				Downwelling Irradiance/ Irradiance from Brown			
		Filter 2	Filter 4	Filter 3	Filter 5	Filter 2	Filter 4	Filter 3	Filter 5	Filter 2	Filter 4	Filter 3	Filter 5
C-444	2305	58.0	64.4	58.4	65.1	578	312	334	221	.82	.60	.48	.44
	725	56.4	62.0	56.6	62.7	524	408	360	206	.70	.69	.48	.36
	280	55.3	60.0	55.5	60.6	831	541	609	284	1.07	.84	.79	.45
C-445	2883	55.0	55.0	55.0	55.0	1020	182	615	234	1.30	.23	.78	.30
	99	55.3	54.9	54.9	55.2	988	185	96.4	80.8	1.27	.23	.12	.10
C-446	884	53.8	53.1	53.5	53.1	370	363	259	339	.45	.43	.31	.41
	248	54.8	53.2	54.5	53.1	590	572	448	373	.75	.69	.56	.45
C-447	3495	53.9	57.4	54.0	57.5	635	580	412	378	.78	.80	.51	.53
	130	53.4	56.1	56.0	58.6	607	285	231	274	.73	.38	.30	.40
C-448	5957	52.8	52.5	52.7	52.5	1170	1080	711	619	1.39	1.27	.84	.73
	74	53.9	52.3	52.3	53.0	800	292	438	325	.98	.34	.51	.39
C-449	5550	54.9	52.3	54.6	52.4	872	883	566	526	1.11	1.03	.71	.62
	2650	57.1	51.9	56.5	51.9	1000	870	548	497	1.37	1.00	.74	.57
	1200	58.9	52.3	58.4	52.2	756	814	508	625	1.11	.95	.73	.73
	260	61.3	53.1	60.7	52.9	681	706	467	420	1.12	.84	.74	.50
C-450A	3995	55.6	53.1	55.5	53.0	1070	1020	741	618	1.33	1.22	.96	.74
	120	57.2	54.2	57.1	52.4	601	582	387	350	.83	.72	.53	.41
C-450B	1100	51.6	51.6	51.5	51.7	901	474	767	290	1.03	.54	.87	.33
	300	52.2	51.4	52.0	51.3	573	512	549	496	.67	.58	.63	.56
C-451	4573	57.0	60.3	57.1	60.5	1040	833	709	497	1.42	1.30	.97	.78
	126	55.7	58.6	58.7	62.2	628	293	134	161	.82	.43	.20	.28
C-452*	3118	65.8	70.6	66.0	70.7	673	168	474	59.2	1.39	.46	.99	.16
	138	63.0	68.9	69.1	72.1	291	122	86.2	88.9	.52	.30	.22	.27
C-453*	3039	59.8	56.2	59.6	56.0	774	876	504	533	1.18	1.16	.76	.70
	116	61.5	57.5	57.6	54.4	411	374	396	312	.68	.52	.55	.39
C-454*	4247	52.1	57.3	52.2	57.8	1180	717	631	315	1.36	.99	.73	.44
	2742	51.8	55.7	51.8	56.0	965	660	675	412	1.11	.86	.77	.54
	1195	51.8	53.9	51.8	54.3	1050	1090	655	451	1.20	1.33	.75	.56
	284	52.2	53.0	52.1	53.2	891	609	656	418	1.03	.73	.76	.50
C-456A*	818	56.4	60.3	57.0	60.8	842	386	520	214	1.13	.60	.71	.34
	289	54.7	58.3	55.0	58.9	581	607	481	398	.73	.87	.61	.59
C-456B*	3654	65.0	69.5	65.2	69.7	309	311	187	186	.61	.80	.37	.48
	92	63.2	67.4	67.3	71.6	385	259	207	71.8	.69	.59	.47	.21

*No pitch and roll information available.

The corresponding sun zenith angles for each filter and altitude are also presented in columns 3 through 6. Columns 11 through 14 contain the ratio of the downwelling irradiance divided by the clear day irradiance for the photopic derived from Brown (1952). This takes out the effect of sun zenith angle. The ratio would be expected to vary with filter as well as cloud cover.

The low-altitude downwelling irradiance values for pseudo-photopic Filter 4 for all the OPAQUE IV flights are graphed in Fig. 8-11.

The symbols indicate the cloud categories used in Table 7.2. Since the altitudes for the lowest straight and level sequences for Filter 4 ranged between 90 and 540 meters above ground level, they can be compared to the ground-level values of Brown (1952). The illuminance values of Brown for unobscured sun, and partial cloud have been converted to irradiance units and depicted as solid curves in Fig. 8-11.

All of the irradiances cluster about the average cloud day irradiances of Brown and none are above the clear day curve. This seems reasonable since all of the data are for skies with scattered to broken clouds or fully overcast.

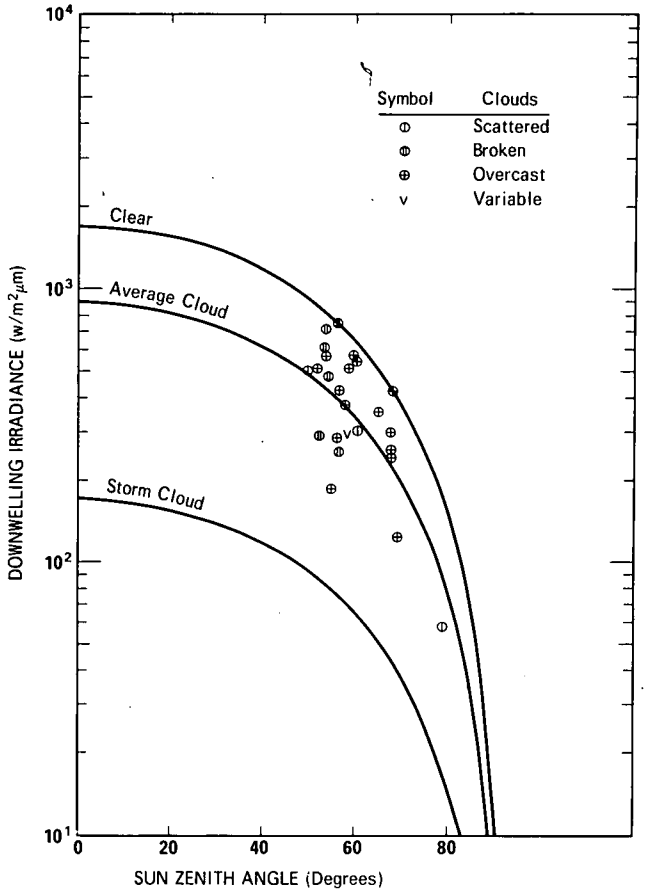


Fig. 8-11. Project OPAQUE IV Low Altitude Downwelling Irradiance for for Filter 4 Pseudo-Photopic Compared to Brown (1952).

The average pitch of the aircraft during the vertical profile sequences was 6 degrees during ascent and −1.1 degrees during descent so that the dual irradiometer was roughly +3.5 degrees from horizontal during ascent and −3.6 degrees from horizontal during descent. The aircraft heading was generally cross sun to minimize this effect. Generally, however, the orientation of the dual irradiometer during the vertical profile could not be kept within as close an angular tolerance as during the straight and level flight elements. Therefore, it is preferable to use the values from the straight and level sequences in Table 8.6 for the absolute values of downwelling irradiance and to use the vertical profile graphs in Section 7.3 to indicate the variability of downwelling irradiance with space and time during the flight.

Vertical profiles wherein the orientation of the irradiometer toward the sun exceed ±4 degrees from horizontal occurred during five flights. Hence, the following vertical profiles of irradiance should be used with caution: flight C-431, Filter 5; flight C-435, Filter 2; flight C-438, Filter 2; flight C-440, Filter 3; and flight C-451, Filters 2 and 3. Roll and/or pitch information documenting the orientation of the irradiometer was unavailable for seven of the flights, and part of the eighth, due to problems with the vertical reference gyro. Hence the vertical profiles for the following flights have a less certain orientation relative to the sun: flight C-432, Filter 2; flights C-434, C-437, C-452, C-453, C-454, C-456A, and C-456B.

In the graphs of downwelling irradiance versus altitude in Section 7.3, the mostly clear to scattered flights, (cloud category 2) all have portions of the profile with stable irradiances. In addition, there are some flights in each of the other three categories with portions of profiles with stable irradiances. Five low altitude profiles in cloud category V (full overcast) have very low fractional standard deviations (0.04 or less) indicating a stable irradiance for the entire profile. These profiles are: C-436, Filter 2; C-433, Filter 2; C-446, Filter 3; C-456A, Filters 2 and 3. In general, the more stable irradiance portions of a flight were the high altitude portions. The average irradiance for each profile divided by the irradiance based on Brown (1952) to correct for sun zenith angle effect, decreased with mean wavelengths of filter except for three overcast flights: flights C-441 and C-450B where the irradiance for Filter 3 was high relative to the Filter 4 irradiance, and flight C-440 where the Filter 4 irradiance was high relative to the Filter 2 irradiance. Conversely, the only flight wherein the irradiance decreased with mean wavelength of filter, *i.e.*, Filter 2>4>3>5 at all altitudes without crossovers was a low altitude overcast flight, C-456A. All other flights had at least some crossovers at some altitudes, with low altitude having generally the most crossovers.

Downwelling irradiance for Filter 4 pseudo-photopic has been graphed separately for the OPAQUE IV flights in Fig. 8-12 in the same groupings by flight track as were Figs. 8-1 and 8-4. There are no irradiance data for Filter 4 flight C-438. The average sun zenith angle for each profile is marked on each graph. There is a large enough range of sun zenith angle on each of the four plots in Fig. 8-12, so that the lower irradiances at the larger sun zenith angles are readily apparent. The other broad feature is the generally higher variability at the lower altitudes due to variation in cloud cover thickness and amount.

Albedo. The albedo is the ratio of the upwelling to downwelling irradiance. The albedos for the OPAQUE IV airborne data are summarized in Table 8.7. The albedos for the flights over water are presented first, and then the flights over land. The low altitude albedos for the four filters lie in a reasonable range for each type of terrain.

The low altitude albedos over water are also in a reasonable range for the low wind speeds. The over-the-water albedos are relatively neutral spectrally as is reasonable since most of the upwelling irradiance is from reflected sky and sunlight and water reflectance is essentially neutral in this region of the spectrum. Most of the over-the-water data were measured in the wind speed range covered by the Beaufort Nos. 2 and 3. Beaufort No. 2 (1.6-3.3 mps) is described as small wavelets, no breaking crests, whereas Beaufort No. 3 (3.4-5.4 mps) has scattered whitecaps. The higher reflectances for C-454 at 9.3 mps are consistent with Beaufort No. 5 (8.0-10.7 mps) with many whitecaps and some spray.

The relatively high albedos at all wavelengths encountered over the Birkhof terrain are consistent with the partially snow-covered terrain.

Although the Mildenhall Track is described as being partially over-the-water of the North Sea, the low altitude albedos are more typical of the expected reflectances over cultivated fields, therefore for ease of comparison, these data are grouped with the tracks flown over cultivated areas. The high alti-

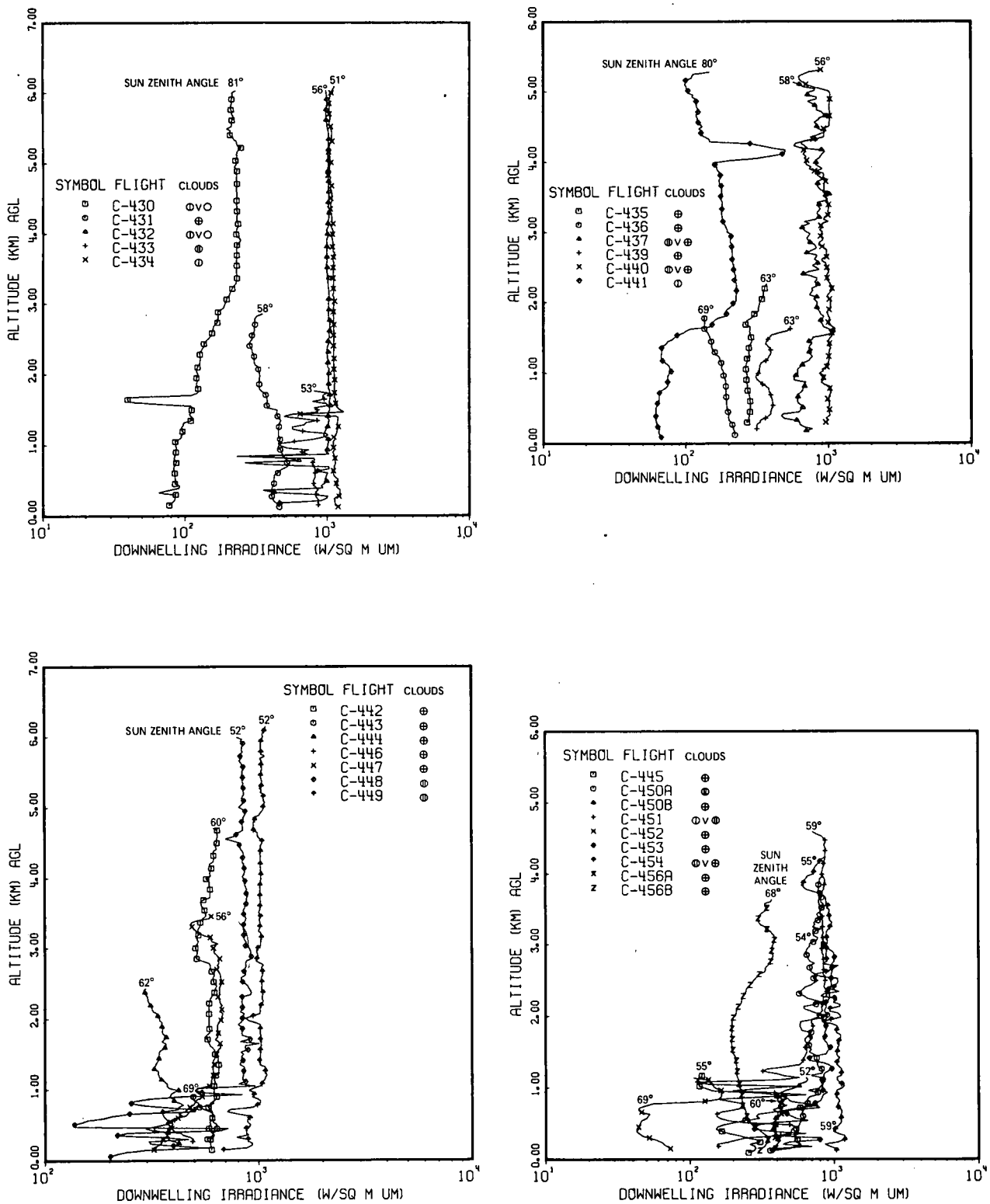


Fig. 8-12. Downwelling Irradiance for Filter 4 Pseudo-Photopic for OPAQUE IV 31 January through 31 March 1978.

Table 8.7. Albedo as Measured by the Dual Irradiometer During Straight and Level Flight Elements

Track	Terrain Description	Wind Speed (mps)	Flight	Average Altitude (meters)	Albedo			
					Filter 2	Filter 4	Filter 3	Filter 5
Trapani, Sicily	Shallow water, nearby coast of brown and green rolling fields	3.0-4.6	C-431	2800	.16	.09	.11	-
				1510	.13	.09	.09	-
				268	.09	.08	.07	-
		3-3.6	C-432	6053	.49	.54	.45	-
				121	.14	.06	.05	-
Sigonella, Sicily	Deep water, nearby coast cultivated brown and green fields	2.5-5.1†	C-434*	6119	.15	.14	.09	.10
				3079	.14	.12	.08	.09
				1574	.10	.09	.07	.08
				294	.08	.07	.07	.06
Rodby, Denmark	Relatively shallow brown water, nearby coast of flat cultivated farmlands with occasional woods and small towns	9.3	C-454*	4247	.14	.14	.14	.15
				2742	.18	.18	.14	.18
				1195	.11	.09	.12	.11
				284	.11	.11	.12	.10
		2.1-4.1	C-456A*	818	.10	.10	.10	.07
				289	.08	.09	.06	.05
		2.1-4.1	C-456B*	3654	.18	.14	.20	.17
				92	.07	.07	.07	.07
Birkhof, Germany	Forest cover with intermittent snow covered fields and valleys		C-435	2200	.47	.49	.50	.60
				462	.51	.54	.44	.44
			C-436	1921	.50	.52	.69	.56
				432	.40	.58	-	.51
			C-437*	5005	.52	.33	.61	.57
				3051	.33	.34	.62	.52
				1536	.30	.25	.53	.54
				477	.19	.35	.80	.52
			C-438	1620	.17	-	-	-
				470	.17	-	-	-
			C-439	1618	.13	.19	.49	.48
				520	.30	.17	.62	.62
			C-440	4719	.30	.35	.43	.37
				3021	.20	.32	.45	.60
				1699	.12	.16	.38	.56
				514	.19	.18	.38	.48
			C-441	5261	.38	.26	.35	.34
				92	.69	.10	.20	.29

*No pitch or roll information available.

†Closest weather station more than 250 km from flight track.

tude reflectances for C-442 for Filters 3 and 5, however, are quite low and may well indicate the influence of the portion of the track over water. The low altitude albedos for Filters 2, 4, 3 and 5 are reasonable for cultivated fields in late winter, early spring with growing crops. Filter 4 values are expected to be slightly higher than the values for Filters 2 and 3. The Filter 5 values also show the expected high reflectance in the near infrared.

The albedos generally increase as expected with altitude. In general, the variability, with wavelength and altitude, is indicative of the variability of the terrain and underlying cloud conditions.

Table 8.7. (Cont'd.) Albedo as Measured by the Dual Irradiometer During Straight and Level Flight Elements

Track	Terrain Description	Wind Speed (mps)	Flight	Average Altitude (meters)	Albedo			
					Filter 2	Filter 4	Filter 3	Filter 5
Mildenhall, England	Both green fields and brown colored water of North Sea	7.2	C-442	4670	.21	.26	.07	.08
				145	.07	.08	.10	.32
		6.1-8.7	C-443	911	.18	.19	.25	.27
				314	.10	.14	.17	.20
Yeovilton, England	Rolling green fields and woods, with occasional brown fields and small towns		C-444	2305	.38	.20	.21	.27
				725	.15	.15	.20	.30
				280	.12	.16	.13	.29
			C-446	884	.09	.10	.15	.31
				248	.05	.09	.09	.30
			C-447	3495	.53	.19	.34	.32
				130	.06	.07	.08	.34
			C-448	5957	.53	.33	.45	.37
				74	.05	.15	.04	.25
			C-449	5550	.15	.19	.14	.15
				2650	.10	.15	.13	.31
				1200	.11	.13	.13	.30
				260	.07	.08	.09	.41
Soesterberg, Netherlands	Brown and green fields, with occasional small towns		C-445	2883	-	.17	.55	.27
				99	.05	.09	.11	.18
			C-450A	3995	.35	-	.26	.31
				120	.05	.07	.08	.22
			C-450B	1100	.16	.15	.11	.27
				300	.09	.13	.08	.15
Meppen, Germany	Green and brown fields, with occasional dark woods and small towns		C-451	4573	.32	.32	.29	.41
				126	.06	.06	.11	.59
			C-452*	3118	.52	.08	.42	.32
				138	.05	.07	.08	.20
			C-453*	3039	.31	.40	.28	.45
				116	.09	.18	.09	.27

*No pitch or roll information available.

8.3. SUMMARY

Twenty-six project data flights have been presented and evaluated with specific attention afforded to profiles of total volume scattering coefficient and downwelling irradiance. Selected meteorological measurements taken concurrently with these profile data have been included as background information and for structural comparisons with the scattering coefficient profiles.

The data for OPAQUE IV represent flights made during the winter, and some data missions were flown under poor to marginal weather conditions. These flights are welcome additions to the real world documentation afforded by the OPAQUE series.

Although the OPAQUE IV flights were contiguous in time and space with some ground level measurements of total volume scattering coefficient, none of these ground data are presented herein, but will be presented in a later report on OPAQUE IV directional properties. However, most vertical profiles were flown down to very low altitudes (330 m to 30 m). Thus the low altitude scattering profile with altitude is relatively well documented.

The addition of this large data sample to our data base greatly improves the breadth and depth of the data catalog now available for further comparative and statistical analysis.

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