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United States Department of State

Washington, D. C. 20520

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'86 NOV 28 P9:03

November 28, 1986

ACTION MEMORANDUM

S/S 11/28

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TO: E - Mr. Wallis

FROM: OES - John D. Negroponte

SUBJECT: Circular 175: Request for Authority to Negotiate a Protocol to the Convention for the Protection of the Ozone Layer

ISSUE FOR DECISION:

Whether to authorize negotiation of a protocol to the Vienna Convention for the Protection of the Ozone Layer which would control emissions of ozone-depleting substances.

ESSENTIAL FACTORS:

The Problem

There is general scientific agreement that human activities are substantially altering the chemistry of the atmosphere in ways which threaten both the quantity and the vertical distribution of ozone. Certain chlorine and bromine substances, when emitted into the atmosphere, act as catalysts in a series of chemical reactions resulting in a depletion of ozone. Ozone depletion, by permitting greater quantities of harmful ultra-violet radiation to reach the earth's surface, will pose significant, even if currently difficult to quantify, risks for health and ecosystems. Given the complex chemistry and dynamics of the atmosphere, scientific uncertainties currently prevent a conclusive determination of safe levels of emissions. Because of the long atmospheric lifetime of these molecules, emissions affect the ozone layer for decades. The nature of the ozone layer requires international action if protective measures are to be effective.

The chemicals at issue for this protocol -- chlorofluorocarbons ("CFCs") and some bromine compounds -- have substantial economic and social value, being widely used in refrigeration, foam-blowing, fire-extinguishers, as solvents, and in most countries as aerosols. (Their use in non-essential aerosols was banned in the United States in 1978.) The U.S., Japan and EC countries currently account for about 90% of world production and consumption.

The International Process

The Vienna Convention for the Protection of the Ozone Layer, adopted under auspices of the U.N. Environment Program (UNEP) on March 22, 1985 and ratified by the United States on August 14, 1986, provides for cooperation in research, monitoring and information exchange. The Convention obliges the Parties to cooperate in taking measures to protect human health and the environment against adverse effects resulting or likely to result from human activities which modify or are likely to modify the ozone layer. The Diplomatic Conference which adopted the Convention did not reach agreement, however, on a protocol to control emissions of ozone-depleting substances. The final act of the Diplomatic Conference called for a series of scientific and economic workshops on the atmospheric science, effects of ozone depletion, and alternative control measures, followed by resumption of negotiations, looking toward adoption of a control protocol in 1987 if possible. Negotiations are to resume December 1, 1986, with a diplomatic conference to conclude the protocol tentatively scheduled for April 1987.

The Domestic Setting

The Environmental Protection Agency, under terms of a court order approving a settlement reached in a lawsuit against the EPA Administrator by the Natural Resources Defense Council, must publish in the Federal Register by May 1, 1987 a proposed decision on the need for further domestic regulation of CFCs under Sec. 157 of the Clean Air Act. Compared to other environmental laws, the Act sets a low threshhold for required action by EPA: "the Administrator shall propose regulations for the control of any substance, practice, process, or activity...which in his judgment may reasonably be anticipated to affect the stratosphere, especially ozone in the stratosphere, if such effect in the stratosphere may reasonably be anticipated to endanger public health or welfare." In this connection, EPA is going through an extensive risk assessment process. A final EPA decision is required by the court order by November 1, 1987.

An important goal in seeking an early and effective international agreement (in addition to the goal of more effectively protecting the ozone layer) is to avoid disadvantage to U.S. industry as a result of unilateral U.S. regulatory action required by the Clean Air Act. Unilateral U.S. action in advance of international agreement could undercut the global control effort.

The principal producer- and user-industry group, the "Alliance for Responsible CFC Policy," has reversed its previous total opposition to controls, issuing a statement September 16, 1986 that "responsible policy dictates, given the scientific uncertainties, that the U.S. government work in cooperation with the world community...to consider establishing a reasonable global limit on the future rate of growth of fully halogenated CFC production capacity."

Proposed Position

Our approach in the international negotiations is intended to influence those negotiations to achieve the most effective international agreement possible. It does not prejudge the EPA Administrator's decision on domestic regulation.

Although considerable evidence exists linking certain chlorine and bromine substances to depletion of ozone, remaining scientific uncertainties prevent any conclusive statement concerning safe levels of emissions. As a result, the Administrator of EPA recommends an international risk management strategy which would give a strong incentive for rapid development and employment of emission controls, recycling practices and safer substitute chemicals. We should therefore seek a protocol that explicitly or in effect provides for:

I. A near-term freeze on the combined emissions of the most ozone-depleting substances;

II. A long-term scheduled reduction of emissions of these chemicals down to the point of eliminating emissions from all but limited uses for which no substitutes are commercially available (such reduction could be as much as 95%), subject to III; and

III. Periodic review of the protocol provisions based upon regular assessment of the science. The review could remove or add chemicals, or change the schedule or the emission reduction target.

These elements would provide a desirable margin of safety against harm to the ozone layer while scientific research continues. At the same time, this approach would provide as

much certainty as possible for industrial planning in order to minimize the costs of reducing reliance on these chemicals, while allowing adequate time for adjustment.

The timing, stringency and scope of the phased reductions will have to be negotiated. We would promote a scheme which allows flexibility for each nation to determine how it will implement domestically its international obligation. In reponse to UNEP's invitation, we have prepared for discussion purposes the attached draft text for the operative paragraphs of a protocol.

- timing
- stringency
- scope

We would favor setting national limits at or near current levels, in order to avoid increases in emissions from any Party. Elimination of most emissions would obviate the difficult question of equity -- the view that developing countries have a right to a fair share of world markets if a global limit on emissions is set: developing countries will have less reason to seek to expand use of products which will be obsolete in the forseeable future and they will benefit from the development of substitutes and of recycling and containment techniques.

- substitutes
- recycling
- containment

We will seek to include in the protocol measures to regulate relevant trade between parties and non-parties in order to create incentives for nations to adhere to the protocol's emissions limits. These measures will have an ancillary effect of protecting U.S. industry from unfair competition. We will assure that any trade provisions included in the protocol are consistent with the General Agreement on Tariffs and Trade (GATT) and other aspects of U.S. trade policy.

We have undertaken extensive consultations with industry and environmental groups and will continue to do so as the negotiations progress.

Legal Authority and Funding

We expect that no additional legislation will be required to implement the provisions of a protocol specifying the regulation of ozone-depleting substances. As discussed in the attached legal memorandum, EPA has authority under the Clean Air Act to regulate ozone-depleting substances which may reasonably be expected to endanger public health or welfare and is currently conducting the risk assessment required to determine the need for additional regulation.

either thru exec agmt or treaty

It has not yet been determined whether this protocol would be concluded as an executive agreement or as a treaty subject to the advice and consent of the Senate. This will depend, in part, on the content of the protocol and nature of the undertakings therein. The requirements of the National Environmental Policy Act (NEPA) and E.O. 12114 on Environmental Effects Abroad of Major Federal Actions are currently being considered.

Thru Convention we must already

Costs related to implementation of a protocol will depend on the requirements of the protocol. As a party to the Vienna Convention for the Protection of the Ozone Layer, we are already committed to the establishment of a Secretariat (in an existing international organization such as UNEP or WMO) and Conference of the Parties when that agreement enters into force. Any additional costs to administer the protocol will be incremental. We will seek to minimize the services required of the Secretariat and any requirement for funding to support such services, and we will make every effort to ensure that necessary support staff are provided within existing levels. EPA will be responsible for reports to the Secretariat, participation in technical reviews, and other commitments of a technical nature assumed under the protocol.

Financial support for a cooperative science program to form the basis for periodic review of the protocol provisions will need to be considered. EPA, NASA, NOAA and other technical agencies would participate in any cooperative science program resulting from the protocol with their own funds. The U.S. already has a dynamic and extensive program on both the atmospheric science and effects science, and as such is already by far the largest contributor to international scientific cooperation in these areas. The protocol may be a means to draw additional commitments from other nations to contribute to scientific efforts. It will be possible to assess the need for any additional U.S. support in this area only as the negotiations progress. We will consult with and obtain the approval of OMB regarding any commitment that could not be satisfied out of currently appropriated funds.

RECOMMENDATION:

That you authorize negotiation of a protocol to the Vienna Convention for the Protection of the Ozone Layer which would control emissions of those substances which are the most

significant contributors to ozone depletion in accordance with the principles outlined above. Subsequent authority will be sought to conclude any international agreement resulting from these negotiations.

Approve HH 11/28/86 Disapprove _____

Attachments:

A. Legal Memorandum
B. Draft protocol text

Circular 175: Protocol for Protection of Ozone Layer

Drafter: OES/ENH:SButcher
11/16/86 647-9312 0936T
Revised 11/26/86 16:00

Clearance: OES:REBenedick
OES/ENH:JRouse
L:EVerville(Substance)
L/OES:DColson
L/OES:DKennedy
L/T:HCollums
L/EBC:GRosen
E:MBailey
EB:ASundquist
IO:LGalini
M/MO:ALaPorta
M/COMP:CCasper
EPA:BLLong
NASA:JFletcher
NOAA:JFletcher
Commerce:MTKelly
USTR:APorges/RReinstein
DPC:THarris
CEQ:CNee
DOE:EWilliams
OMB:JIrwin/DGibbons

United States Department of State

Washington, D.C. 20520

MEMORANDUM OF LAW

SUBJECT: Authority to Negotiate a Protocol to the Convention for the Protection of the Ozone Layer to Control Emissions of Ozone-depleting Substances

The accompanying action memorandum from OES requests authorization to negotiate a protocol to the Vienna Convention for the Protection of the Ozone Layer which would control emissions of substances, such as certain chlorine and bromine substances, that deplete stratospheric ozone. As indicated in the action memorandum, the United States is supportive of a protocol that would impose a freeze on emissions of most ozone-depleting substances, followed by a long-term scheduled reduction of emissions of these substances to a point of eliminating all but limited uses for which there are no commercially available substitutes -- subject to periodic review of the protocol, and if scientifically warranted, modification of its provisions.

Legal authority to negotiate such a protocol derives from the constitutional authority of the President to conduct foreign relations and the statutory authority of the Secretary of State, 22 U.S.C. §2656, to manage the foreign affairs of the United States on a day-to-day basis. There is also ample statutory authority for the negotiation of international environmental agreements specifically.

For example, section 102(F) of the National Environmental Policy Act of 1969 directs all agencies of the federal government to "recognize the worldwide and long-range character of environmental problems and, where consistent with the foreign policy of the United States, lend appropriate support to initiatives, resolutions, and programs designed to maximize international cooperation in anticipating and preventing a decline in the quality of mankind's world environment." 42 U.S.C. §4332(F). Likewise, section 2 of the United Nations Environment Program Participation Act of 1973 provides that "[i]t is the policy of the United States to participate in coordinated international efforts to solve environmental problems of global and international concern." 22 U.S.C. §287 note. The participation of the United States in the negotiation of the proposed protocol would be consistent with that policy.

With respect to the development of international agreements for the protection of the stratosphere, section 156 of the Clean Air Act grants the President the authority "to enter into international agreements to foster cooperative research ... and to develop standards and regulations which protect the stratosphere consistent with regulations applicable within the United States." 42 U.S.C. §7456. This section further authorizes the President, through the Secretary of State and the Assistant Secretary for Oceans and International Environmental and Scientific Affairs, to "negotiate multilateral treaties, conventions, resolutions, or other agreements, and formulate, present, or support proposals at the United Nations and other appropriate international forums." Id.

The key aspect of the protocol will be the parties' commitment to control their emissions of certain ozone-depleting substances. Under section 157 of the Clean Air Act, 42 U.S.C. §7457, EPA currently has the statutory authority to regulate such substances where they may reasonably be expected to endanger public health or welfare. Thus, it is anticipated that this obligation would be within the purview of existing U.S. legislation, although it may be necessary for EPA to promulgate additional regulations to implement specific control measures. Other statutory authorities under which regulations related to the protection of stratospheric ozone have been issued--e.g., the Federal Food, Drug, and Cosmetic Act, 21 U.S.C. §301 et seq.; the Consumer Product Safety Act, 15 U.S.C. §2051 et seq.; and the Toxic Substances Control Act, 15 U.S.C. §2601 et seq.--also may provide, if necessary, a supplemental basis for meeting U.S. obligations under the protocol.

Final determination of whether the protocol should be concluded as a treaty or an executive agreement and whether it is consistent with existing U.S. laws obviously is dependent upon a final text. In the event the final text of the protocol imposes obligations on the United States that exceed existing laws, the protocol most likely will need to be concluded as a treaty, subject to the advice and consent of the Senate to ratification. It may also be necessary to seek new legislation permitting the implementation of the protocol before its entry into force.

While the provisions to be included in the protocol are still in an evolutionary stage, the action memorandum and attached drafted protocol text indicates that the U.S. delegation will propose for incorporation in the protocol measures regulating the trade of ozone-depleting chemicals and technologies for producing those chemicals between parties to

the protocol and non-parties. (There is currently no definitive U.S. position with respect to additional trade controls.) Under section 157 of the Clean Air Act, the Administrator of the Environmental Protection Agency has authority to promulgate regulations for the control of any substance, practice, process or activity (or any combination thereof) which in his judgment may reasonably be anticipated to affect the stratosphere, especially ozone in the stratosphere, if such effect may reasonably be anticipated to endanger public health or welfare. 42 U.S.C. §7457. The language of section 157 appears to be broad enough to permit the issuance of regulations by EPA to implement a protocol provision requiring trade restrictions to protect against ozone depletion and its attendant deleterious effects.

However, if the authority granted pursuant to section 157 is insufficient for this purpose, section 6 of the Toxic Substances Control Act ("TSCA"), 15 U.S.C. §2605, generally authorizes the EPA Administrator to prohibit or limit by rule the manufacture (defined to include importation) and distribution in commerce of a chemical substance or mixture presenting an unreasonable risk of injury to health or the environment, such as the ozone-depleting substances at issue here.1/ Correlatively, section 13 of TSCA requires the Secretary of Treasury to refuse entry into the Customs territory of the United States any chemical substance or mixture, or article containing a chemical substance or mixture, offered for entry in violation of a rule issued under section 6 of TSCA. See 15 U.S.C. §2612.

EPA's authority to regulate the export of such substances, mixtures, or articles under TSCA is somewhat circumscribed. With the exception of certain labelling, notification, reporting and information-retention requirements, TSCA is inapplicable to a chemical substance or mixture, or article containing a chemical substance or mixture, that is manufactured, processed, or distributed in commerce solely for export from the United States unless the Administrator finds that it presents an unreasonable risk of injury to health within the United States or to the environment of the United States. TSCA section 12, 15 U.S.C. §2611. In this case, because the environmental problem is global in nature and consequently requires corrective measures universally, it is likely that such a finding could be made--i.e., that such

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1/ EPA may exercise its regulatory authority under TSCA if the Administrator finds that a risk of injury to health or the environment could not be effectively eliminated under another statute administered by EPA or by another federal agency. TSCA sections 6(c) and 9(a), 15 U.S.C. §§2605(c) and 2608(a).

exports in the long-run will have adverse health or environmental effects within the United States. Indeed, EPA made such a finding in 1978 when it prohibited (subject to an exception for certain essential uses and uses in articles exempted under section 3 of TSCA, 15 U.S.C. §2602) the processing of chlorofluorocarbons (CFCs) into aerosol propellant articles intended for export.2/ 43 Fed. Reg. at 11,319 and 11,321 (1978).3/

The validity of a restriction on relevant trade with non-parties in relation to the obligations of the United States under the General Agreement on Tariffs and Trade (GATT) has also been examined. The GATT normally bans quantitative restrictions on imports or exports and prohibits import charges in excess of tariff concessions. However, in consultation with the United States Trade Representative, we have concluded that a trade restriction could be drafted appropriately to fall within the general exception to the GATT contained in Article XX(b) which permits the adoption or enforcement of measures by contracting parties necessary to protect human, animal or plant life or health. Article XX(g) of the GATT also contains a general exception for the adoption or enforcement of measures "relating to the conservation of exhaustible natural resources if such resources are made effective in conjunction with restrictions on domestic production or consumption which could also be applicable." Ozone-related trade measures could be justified under Article XX(g) as relating to the conservation of the ozone layer, an exhaustible natural resource, since the parties to the agreement would presumably be applying restrictions on domestic production or consumption. It should be noted, however, that these exceptions to the GATT are

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2/ EPA's 1978 ban prohibited all non-essential aerosol propellant uses of CFCs--a suspected ozone-depleting chemical. EPA's action was proposed and initiated under TSCA before the addition of section 157 (the stratospheric ozone protection provisions) to the Clean Air Act. In the Federal Register notice of its action, EPA observed that "[b]ecause chlorofluorocarbon emissions anywhere in the world deplete the ozone layer and adversely affect health and the environment of the United States, the Administrator finds that chlorofluorocarbon discharges from aerosol propellant articles made in the United States and shipped abroad also cause an unreasonable risk of injury." 43 Fed. Reg. 11,319 (1978).

3/ The Export Administration Act, 50 U.S.C. App. 2401 et. seq., could also provide a vehicle for regulating the export of protocol-covered chemicals and technologies related to their production.

subject to the requirement that measures not be applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail or a disguised restriction on international trade. GATT, Article XX.

In light of the above, there is no legal objection to the negotiation of a protocol to the Vienna Convention for the Protection of the Ozone Layer as outlined in the accompanying action memorandum, subject to the concurrence of L and other interested bureaus in the final text of the protocol and provided additional Circular 175 authority is obtained for conclusion of the protocol.

David A. Colson
Assistant Legal Adviser for
Oceans, International
Environmental and Scientific Affairs

Drafted: L/OES:DKennedy DK
11/20/86 x71370

Clearance: L/T:HCollums
L/EBC:GRosen (draft)
EPA/OGC:NKetcham-Colwill
USTR/OGC:APorges
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ACTION OES-09

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	HUD-02	IO-10	EXIM-06	NEA-07	NSF-01	ARA-00	NSAE-00
	L-03	LAB-04	TRSE-00	PM-10	EAP-00	OPIC-07	CEA-01
	DOTE-00	OMB-01	STR-10	SIL-01	NMS-06	AGRE-00	FRB-01
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USOECD

FOR OES, IO/SCT AND E
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USDOC FOR M. KELLEY AND E. SHYKIND
USDOC FOR NOAA T. CALIO
WHITEHOUSE FOR OPC T. HARRIS
WHITEHOUSE FOR CEQ A. HILL
NASA FOR R. WATSON
USTR FOR REINSTEIN
DOE FOR T. WILLIAMS
NAIROBI ALSO FOR UNEP PERM REP
BRUSSELS FOR USEC
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E.O. 12356: N/A
TAGS: SENV, UNEP, OTRA
SUBJECT: UNEP NEGOTIATIONS ON PROTOCOL TO PROTECT OZONE LAYER, GENEVA, DECEMBER 1-5, 1986 (DELEGATION REPORT)

REF: A) STATE 364665, B) STATE 349396, C) STATE 255252 (NOTAL)

1. SUMMARY: FIRST ROUND OF RESUMED NEGOTIATIONS BY QUOTE AD HOC GROUP OF GOVERNMENT-DESIGNATED LEGAL AND TECHNICAL EXPERTS FOR PREPARATION OF A PROTOCOL ON CHLOROFLUOROCARBONS TO THE VIENNA CONVENTION FOR THE PROTECTION OF THE OZONE LAYER UNQUOTE CONCLUDED EARLY FRIDAY AFTERNOON (DECEMBER 5). REPRESENTATIVES FROM ALL REGIONAL BLOCS AGREED THAT NEW MEASURES MUST BE TAKEN IN NEAR-TERM TO CONTROL EMISSIONS OF OZONE DEPLETING CHEMICALS. HOWEVER, WHILE DIFFERENCES OVER THE SCOPE, STRINGENCY AND TIME-PHASING OF CONTROL MEASURES WERE NARROWED, THEY WERE NOT RESOLVED. DISCUSSIONS HELPED CLARIFY SPECIFICS AND RATIONALE OF VARIOUS PROPOSALS; DELINEATED ISSUES RELATED TO CONTROL STRATEGIES, TRADE ASPECTS, AND DEVELOPING COUNTRY PARTICIPATION THAT REQUIRE FURTHER ANALYSIS BY THE U.S. AND OTHERS; ESTABLISHED THAT EUROPEAN COMMUNITIES (EC), JAPAN AND USSR ARE PREPARED TO MOVE BEYOND PREVIOUSLY-HELD POSITIONS (ALTHOUGH HOW FAR IS YET TO BE DETERMINED); AND REVEALED UNEXPECTEDLY STRONG DEVELOPING COUNTRY SUPPORT FOR A PROTOCOL AND U.S. POSITIONS IN GENERAL (ALBEIT FROM A SPARSE LDC TURNOUT). PROSPECTS FOR NEXT SESSION HEAVILY DEPENDENT UPON EUROPEAN COMMUNITIES' WILLINGNESS TO CONSIDER CONTROL MEASURES OVER LONG TERM, AND UNEP'S ABILITY TO PREPARE ADEQUATE BASIS FOR DISCUSSIONS, INCLUDING ATTRACTING PARTICIPATION BY MORE GOVERNMENTS. OVERALL, USDEL BELIEVES IMPORTANCE OF THIS INITIAL ROUND OF NEGOTIATIONS CAPTURED VERY WELL IN WASHINGTON POST EDITORIAL OVER WEEKEND WHICH OBSERVED THAT QUOTE ALL THE MOVEMENT IS IN THE RIGHT DIRECTION UNQUOTE. END SUMMARY.
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2. PARTICIPATION: WEEK-LONG NEGOTIATING SESSION ATTRACTED SOME 120 PARTICIPANTS FROM 25 GOVERNMENTS AND THE COMMISSION FOR THE EUROPEAN COMMUNITIES, 5 OTHER INTERGOVERNMENTAL ORGANIZATIONS (UNEP, OECD, WMO, ECE, AND COUNCIL OF EUROPE), AND NINE NONGOVERNMENTAL INTERNATIONAL BODIES, INCLUDING INTERNATIONAL CHAMBER OF COMMERCE, EUROPEAN CHEMICAL INDUSTRY AND AEROSOL ASSOCIATIONS, ENVIRONMENTAL DEFENSE FUND, WORLD RESOURCES INSTITUTE AND NATURAL RESOURCES DEFENSE COUNCIL. GOVERNMENT PARTICIPATION WAS ONLY ONE-HALF OF UNEP'S EARLIER ESTIMATE (OF 55): (ARGENTINA, AUSTRALIA, AUSTRIA, BELGIUM, BRAZIL, CANADA, DENMARK, EGYPT, FINLAND, FRANCE, FRG, HUNGARY, ITALY, JAPAN, MEXICO, NETHERLANDS, NORWAY, PHILIPPINES, PORTUGAL, SWEDEN, SWITZERLAND, USSR, USA, UK, AND URUGUAY)

FOLLOWING WERE NOTABLE ABSENCES: CHINA, INDIA, KENYA, NIGERIA, AND EC MEMBERS IRELAND, SPAIN, AND GREECE. BELGIUM, NEW CHAIR OF COUNCIL OF EUROPEAN COMMUNITIES BEGINNING ON 1 JANUARY, WAS REPRESENTED (ON LIMITED BASIS ONLY) BY GENEVA MISSION OFFICER, AS WAS MEXICO. LARGE AMERICAN CONTINGENT PRESENT. IN ADDITION TO OFFICIAL DELEGATION HEADED BY STATE DEPARTMENT DEPUTY ASSISTANT SECRETARY RICHARD BENEDICK), SESSION ATTRACTED SIX CONGRESSIONAL STAFFERS, FIVE INDUSTRY REPRESENTATIVES AND FOUR PRIVATE ENVIRONMENTAL ORGANIZATIONS.

3. ATMOSPHERICS: MEETING ABLY RUN BY ELECTED BUREAU: WINFRED LANG (AUSTRIA) CHAIRMAN; VLADIMIR ZAIKAROV (USSR) AND AHMED IBRAHIM (EGYPT) VICE-CHAIRMEN; GERALDO NASCIMENTO-SILVA (BRAZIL) RAPPORTEUR. UNEP DEPUTY EXECUTIVE DIRECTOR WILLIAM MANSFIELD SET GOOD TONE IN OPENING STATEMENT WHICH EMPHASIZED ACCUMULATING SCIENTIFIC EVIDENCE OF THREAT TO GLOBAL ECOSYSTEM AND THE SOLID GROUNDWORK AND MOMENTUM WHICH THE PAST TWO YEARS OF INTERNATIONAL SCIENTIFIC MEETINGS AND CONSULTATIONS HAD CREATED. MANSFIELD'S QUOTE RISING TIDE IN THE AFFAIRS OF MEN UNQUOTE WAS SOMEWHAT STEMMED, HOWEVER, BY UNEP'S FAILURE TO HAVE KEY DRAFT PROTOCOL TEXTS (BY U.S. AND CANADA) AVAILABLE FOR DISTRIBUTION UNTIL SECOND DAY, AND SUBSEQUENT INABILITY TO PRODUCE TRANSLATIONS OF MEETING ROOM PAPERS QUICKLY IN ALL LANGUAGES. (USER RESERVED ON FINAL REPORT IN ABSENCE OF RUSSIAN VERSION.)
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4. MEETING WAS VERY USEFUL IN DEFINING A COMMON UNDERSTANDING OF KEY CONCERNS AND OPTIONS ON WHICH AN EFFECTIVE SECOND SESSION DEPENDS. SEVERAL DELEGATES

EXPRESSED STRONG SUPPORT FOR U.S. TRADE ARTICLE. EC PROPOSAL CALLED FOR STUDY ONLY. INFORMAL DISCUSSIONS REVEALED BROAD INTEREST IN INCLUDING TRADE PROVISION IN PROTOCOL TO PROVIDE NECESSARY TEETH AND SAFEGUARDS, AND ALSO IN EXAMINING THE FEASIBILITY OF HAVING IT INCLUDE PRODUCTS WHICH CONTAIN OR ARE MADE WITH CONTROLLED CHEMICALS.

(F) DEVELOPING COUNTRY TREATMENT - NORDIC AND USSR PROPOSALS BOTH EXEMPTED LDCS FROM CONTRACT PROVISIONS, SOVIETS PROVIDING COMPLETE EXEMPTION WHILE NORDICS APPLYING PROVISIONS ONLY TO PARTIES WITH PER CAPITA USE ABOVE 0.2 KG. CANADA INDICATED SUPPORT FOR EXEMPTION OF ANY COUNTRY WITH PER CAPITA USE BELOW WORLD AVERAGE (0.16 KG.). ARGENTINA ARGUED STRONGLY FOR A QUOTE POLLUTER PAYS APPROACH UNQUOTE, WITHOUT ELABORATING. (ARGENTINE REPRESENTIVE VERY HELPFUL AND SUPPORTIVE OF U.S. POSITIONS THROUGHOUT, AS WAS EGYPTIAN DELEGATE.)

1. NEXT WORKING GROUP MEETING: UNEP SECRETARIAT ANNOUNCED THAT NEXT MEETING HAS BEEN SCHEDULED FOR FEBRUARY 23-27, 1987. HOWEVER, EC (WITH JAPANESE SUPPORT) ASKED FOR POSTPONENT UNTIL APRIL, SINCE EC COUNCIL WILL NOT MEET UNTIL MARCH 20. USSR FURTHER COMPLICATED SITUATION BY SAYING THAT NO FURTHER SESSION SHOULD BE HELD UNTIL UNEP'S GOVERNING COUNCIL (WHICH CONVENES IN MID-JUNE) CAN CLARIFY WORKING GROUP'S MANDATE REGARDING SCOPE OF CHEMICALS TO BE CONSIDERED. U.S., NORDICS, CANADA AND ARGENTINA STRONGLY ARGUED THAT FEBRUARY DATE (KNOWN TO ALL PARTIES FOR OVER A YEAR) SHOULD BE MAINTAINED. RESULT WAS THAT WORKING GROUP REFERRED THE ISSUE TO UNEP EXECUTIVE DIRECTOR TOLBA FOR RESOLUTION. STPEATOR

INFO LOG-00 COPY-01 ADS-00 AID-00 INR-10 EUR-00 SS-00
OIC-02 AF-00 CIAE-00 EB-00 DINT-05 DODE-00 H-01
IO-10 NEA-06 NSF-01 ARA-00 NSAE-00 COME-00 L-03
PM-10 EAP-00 STR-10 OES-05 ACDA-12 USIE-00 DOEE-00
CEQ-01 PRS-01 SPPR-03 DIG-01 /112 R

DRAFTED BY: EPA/OIA:JLOSEY
APPROVED BY: EUR: GWILKINSON
OES/E:REBLNEDICK IO/T:KFIEDLER
EUR/RPE:MCARTLR-TRIPP USTR:IFULLER (SUBS)
DOC:MKELLY (SUBS) EB/OT/DCT:KMCGUIRE
EPA/OIA:BLLONG OES/LMH:JROUSL/SBUTCHER
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LIMITED OFFICIAL USE STATE 016544

BRUSSELS ALSO FOR USEC, PARIS ALSO FOR USOECD

E.O. 12356: N/A
TAGS: SENV, OTRA, UNEP, EC
SUBJECT: OZONE LAYER PROTECTION NEGOTIATIONS

REF: (A) 86 PARIS 36668
(B) STATE 349396
(C) STATE 346714

1. THIS IS AN ACTION CABLE: SEE PARA 5-7.

2. SUMMARY: PROTECTION OF THE OZONE LAYER HAS BECOME A FOCUS OF SUBSTANTIAL ENVIRONMENTAL, ECONOMIC AND POLITICAL INTEREST IN THE UNITED STATES, WITH INTENSE INTEREST BEING SHOWN BY CONGRESS, CITIZENS' GROUPS, AND PRIVATE INDUSTRY. FIRST SESSION OF UNEP-SPONSORED NEGOTIATIONS ON AN OZONE LAYER PROTOCOL (DEC. 1 - 5, GENEVA) ATTRACTED CONSIDERABLE DOMESTIC AND INTERNATIONAL MEDIA ATTENTION: E.G., ARTICLES IN WSJ AND NYT, AND LEAD EDITORIALS IN WASH POST, NYT, AND IHT (12-8-86) -- WITH VERY POSITIVE REACTION TO USG POSITION IN NEGOTIATIONS. AT THE DEC. SESSION, USG DIFFERED WITH EC ON THE CONTENTS OF THE PROTOCOL AND ON THE NEGOTIATING TIMETABLE (SEE REFTEL A). USG BELIEVES THAT ULTIMATELY EC ACCEPTANCE WILL BE NEEDED FOR A PROTOCOL TO BE EFFECTIVE (EC CFC PRODUCTION IS ABOUT 40 PERCENT OF WORLD TOTAL). MISSION ASSISTANCE AT EC POLICY LEVEL, AND EMBASSY ASSISTANCE AT EQUIVALENT LEVELS OF BOTH FOREIGN AND ENVIRONMENT MINISTERS, COULD PROVE CRITICAL IN STIMULATING MOVEMENT IN EC POSITION. DEPARTMENT HOPES MISSION/EMBASSIES CAN ENGAGE IN CONTINUING DIALOGUE ON THESE ISSUES WITH RELEVANT OFFICIALS OVER THE NEXT FEW WEEKS. END SUMMARY.

3. PROTOCOL CONTENTS: DIFFERENCES BETWEEN EC AND USG POSITIONS ARE DETAILED IN REFTEL. FROM USG VIEWPOINT, THE PRIMARY DEFICIENCIES OF EC POSITION ARE: (A) FAILURE TO ADDRESS LONGER TERM (EC CALLS FOR A FREEZE AND UNSPECIFIED "REASSESSMENT"; USG SUPPORTS PHASED REDUCTIONS SUBJECT TO PERIODIC SCIENTIFIC REVIEW); (B) LIMITED COVERAGE (EC WOULD ONLY CONTROL CFC 11 AND 12; USG WOULD CONTROL ALL MAJOR OZONE DEPLETERS); (C) FAILURE TO ADDRESS EXPORTS/IMPORTS AND NON-PARTIES' PRODUCTION OF OZONE-DEPLETING CHEMICALS (WHICH COULD ALLOW EVASION OF CONTROLS AND UNFAIR TRADE ADVANTAGES).

4 NEGOTIATING TIMETABLE: UNEP SCHEDULE OF FIRST WORKING GROUP SESSION IN DEC.'86, SECOND SESSION IN FEB.'87, AND DIPLOMATIC CONFERENCE IN APRIL '87 HAS BEEN PLANNED SINCE SEPT 1985. HOWEVER, AT DEC. SESSION, EC DELEGATIONS ASKED THAT SECOND SESSION BE POSTPONED UNTIL AFTER EC ENVIRONMENT MINISTERS MEETING MARCH 20, SO THEY COULD OBTAIN FURTHER NEGOTIATING AUTHORITY. (FYI: OUR UNDERSTANDING IS THAT MINISTERIAL LEVEL MEETING IS NOT NECESSARY TO OBTAIN FURTHER NEGOTIATING AUTHORITY, AND THAT A MEETING OF EC PERMREPS WOULD SUFFICE).

- USG AND SEVERAL OTHER DELEGATIONS STRONGLY SUPPORTED UNEP TIMETABLE, ON THE GROUNDS THAT: (A) TIMETABLE HAD BEEN PROPOSED BY UNEP OVER A YEAR AGO; (B) THE EC JUST HAD AN ENVIRONMENT MINISTERS MEETING (NOV. 24), WHICH WE BELIEVE) GAVE THEM A SUFFICIENTLY FLEXIBLE MANDATE TO NEGOTIATE; AND (C) (NOT STATED PUBLICLY AT DEC. MEETING) DEFERRING TO THE EC WOULD SET BAD PRECEDENT OF SUBORDINATING INTERNATIONAL MEETING SCHEDULES TO THE EC'S REGULAR BI-ANNUAL MEETING SCHEDULE.

- BECAUSE THERE WAS NO CONSENSUS DURING DECEMBER WORKING GROUP ON THE DATE OF THE NEXT MEETING, IT WAS AGREED THAT UNEP EXEC DIR TOLBA WOULD MAKE THE FINAL DECISION. WE UNDERSTAND THAT TOLBA URGED EC TO STICK WITH THE FEBRUARY DATE, AND THAT THE EC HAS NOW AGREED. FURTHER, WE HAVE HEARD THAT EC WILL HOLD A MEETING FEBRUARY 13 TO CONCERT ITS POSITION.

- REGARDING THE REST OF THE SCHEDULE, THE USG CONTINUES TO BELILVE THAT THE DIPLOMATIC CONFERENCE SHOULD BE HELD IN APRIL.

5. FOR US MISSION EC: MISSION IS REQUESTED TO CONTACT EC COMMISSIONER CLINTON DAVIS AND CONSULT WITH OTHER PERMREPS AND OTHER EC OFFICIALS AS APPROPRIATE TO:
(A) ASCERTAIN CURRENT EC THINKING ON THE PROTOCOL NEGOTIATIONS: E.G., THEIR VIEW ON RESULTS OF DEC. SESSION AND POSSIBLE CHANGES IN EC POSITION. (YOU MAY DRAW ON REFTELS FOR BACKGROUND ON THE ISSUES INVOLVED.)

(B) CONFIRM THAT EC IS PLANNING ON FEBRUARY 23-27 NEGOTIATING DATES AND WILL BE PREPARED TO PARTICIPATE FULLY. IF THERE IS ANY DOUBT ABOUT THIS, CONVEY ABOVE USG VIEWS REGARDING NEGOTIATING SCHEDULE, URGING EC TO INTERPRET ITS EXISTING NEGOTIATING AUTHORITY MORE FLEXIBLY OR OBTAIN MORE EXPLICIT AUTHORITY THROUGH OTHER AVAILABLE EC MECHANISMS. THE ALTERNATIVE WOULD BE FOR

MAJOR INTERNATIONAL NEGOTIATIONS TO BE SHACKLED TO THE EC'S SEMIANNUAL DECISION-MAKING PROCESS, WHICH IS UNACCEPTABLE TO USG AND OTHERS. WILL FEB 13 MEETING BE MINISTERS, PERHAPS, OR EXPERTS?

- (C) INDICATE USG DISAPPOINTMENT IN EC POSITION AT DECEMBER SESSION AND ENCOURAGE MOVEMENT, IN PARTICULAR ON LONGER TERM REDUCTIONS, TRADE PROVISIONS, AND THE SCOPE OF CHEMICALS COVERED.

- (D) NOTE USG DISAPOINTMENT IN NON-ATTENDANCE OF BELGIUM, GREECE, SPAIN, AND PORTUGAL AT DEC. SESSION. (ANY INSIGHTS THAT MIGHT BE GLEANED ON THEIR POSITIONS WOULD BE USEFUL, SINCE SOME LC PARTICIPANTS INDICATED THAT THESE COUNTRIES WERE A CONSTRAINT ON EC MOVEMENT.)

IN ADDITION, WOULD APPRECIATE YOUR VIEWS AND SUGGESTIONS ON HOW USG AND OTHERS MIGHT ENCOURAGE EC TO BECOME MORE RESPONSIVE, AND ANY BACKGROUND ISSION CAN PROVIDE ON EC MOTIVES AND CONSTRAINTS. MISSION S ASSISTANCE IS GREATLY APPRECIATED.

6. FOR EC CAPITALS: PLEASE DRAW UPON ABOVE POINTS WITH HOST GOVERNMENT, INCLUDING FOREIGN MINISTRIES AS WELL AS ENVIRONMENT AGENCIES, AT APPROPRIATE HIGH LEVELS TO INFLUENCE POSITION ON WHAT U.S. REGARDS AS A MAJOR INTERNATIONAL ENVIRONMENTAL ISSUE.

7. FOR STOCKHOLM, OSLO, HELSINKI: DRAWING ON ABOVE AS BACKGROUND, PLEASE CONSULT WITH HOST GOVERNMENT ON THEIR VIEWS AND STATUS OF THEIR EFFORTS IN CONSULTING WITH EC MEMBERS AND OTHERS, ENCOURAGING ACTIVE EFFORTS BY NORDICS. WE WILL BE IN TOUCH WITH NORDICS SHORTLY REGARDING CONSULTATIONS PRIOR TO NEXT NEGOTIATING SESSION. SHULTZ

United States Proposed Protocol Text

UNEP Negotiations on an Ozone Layer Protocol

December 1-5, 1986
Geneva, Switzerland

The United States believes that the potential risks to the stratospheric ozone layer from certain man-made chemicals require early and concerted action by the international community. Since the adoption in Vienna in March 1985 of the Ozone Layer Convention, an intensive scientific research and technical analysis effort has been carried out and is continuing, as reflected in the recent series of UNEP-Sponsored workshops. The results continue to indicate the emergence of a serious environmental problem of global proportions.

The United States further believes that governments should pursue three broad objectives during the course of the negotiations, to be embodied and elaborated in the final protocol. These are:

A. Agreement on a meaningful near-term first step to reduce significantly the risk of stratospheric ozone depletion and associated environmental and human health impacts.

B. Agreement on a long-term strategy and goals for coping with the problem successfully.

C. Agreement on a carefully-scheduled plan for achieving the long-term goals, including periodic reassessment and appropriate modification of the strategy and goals in response to new scientific and economic information.

In response to UNEP's invitation, the U.S. has prepared for discussion purposes a draft text based on the U.S views statement which we recently circulated. This text is for the operative articles only, and is designed for incorporation into the protocol text developed during the previous round of negotiations (i.e., it would replace Articles II through V of the fourth revised draft text).

The United States believes that what is required is a straightforward, cost-effective approach that will provide technology incentives and clear targets to governments and industry for developing and introducing new technologies for chemical conservation, recycling and substitution. The U.S. believes that its proposed text provides such an approach.

U.S. DRAFT PROTOCOL TEXT: OPERATIVE ARTICLES

Article II: Control Measures

1. Within [ ] year after entry into force of this Protocol, each Party shall ensure that its aggregate annual emissions of fully-halogenated alkanes does not exceed its 1986 level.

2. Within [ ] years after entry into force of this Protocol, each Party shall ensure that its aggregate annual emissions of fully-halogenated alkanes is reduced by [20] percent from its 1986 level.

3. Within [ ] years after entry into force of this Protocol, each Party shall ensure that its aggregate annual emissions of fully-halogenated alkanes is reduced by [50] percent from its 1986 level.

4. Within [ ] years after entry into force of this Protocol, each Party shall ensure that its aggregate annual emissions of fully-halogenated alkanes is reduced by [95] percent from its 1986 level.

5. The right of any Party to adopt control measures more stringent than contained herein is not restricted by this Article.

Article III: Calculation of Aggregate Annual Emissions

1. For the purposes of Article II, each Party shall calculate its aggregate annual emissions by taking its:

   a. aggregate annual production;

   [b. plus aggregate annual bulk imports;]

   [c. minus aggregate annual bulk exports to other Parties;]

   [d. minus aggregate annual amount of fully-halogenated alkanes which have been destroyed or permanently encapsulated.]

2. To calculate the aggregate amounts specified in the sub-paragraphs of paragraph 1, each Party shall multiply the amount of each fully-halogenated alkane by its ozone depletion weight, as specified in Annex A, and then add the products.

Article IV: Assessment and Adjustment of Control Measures

1. The Parties shall cooperate in establishing an international monitoring network for detecting, or aiding in the prediction of, modification of the ozone layer.

2. At least one year before implementing the reductions specified in paragraphs 2, 3, and 4, respectively, of Article II, the Parties shall convene an ad hoc panel of scientific experts, with composition and terms of reference determined by the Parties, to review advances in scientific understanding of modification of the ozone layer and the potential health, environmental, and climatic effects of such modification.

3. In light of such scientific review, the Parties shall jointly assess and may adjust the stringency, timing, and scope of the control measures in Article II and the ozone depletion weights in Annex A.

4. Any such adjustment shall be made by amending Article II and/or Annex A as provided in Article 9 of the Convention, except that such amendment would not be subject to the six month advance notice requirement of paragraph 2 of that Article.

Article V: Control of Trade

1. Within [ ] years after entry into force of this Protocol, each Party shall ban the import of fully-halogenated alkanes in bulk from any state not party to this Protocol [, unless such state is in full compliance with Article II and this Article and has submitted information to that effect as specified in paragraph 1 of Article VI].

2. Within [ ] years after entry into force of this Protocol, each Party shall ban:
   a. the export of technologies to the territory of non-parties
   [b. direct investment in facilities in the territory of non-parties]
   for producing fully-halogenated alkanes [, unless such state is in full compliance with Article II and this Article and has submitted information to that effect as specified in paragraph 1 of Article VI].

3. The Parties shall jointly study the feasibility of restricting imports of products containing or produced with fully-halogenated alkanes from any state not party to this Protocol.

REPORT OF THE TRADE WORKING GROUP ON OZONE/CFC ISSUES

Formula for Calculating Emissions

The Trade Group has reached general consensus on how to approach the definition of "emissions" of ozone-depleting chemicals in the protocol, i.e., the formula affecting trade among parties to the protocol. The Group still believes the initial U.S. position in favor of apparent consumption ("adjusted production," defined as production plus imports minus exports) represents the best formula in terms of meeting U.S. objectives (widest acceptability, least trade distortion, least impact on U.S. economy). However, since the EC position on including specific limits on production is adamant, the Group believes combining consumption limits with production limits (as proposed by Sweden in the April meeting in Geneva) may be acceptable. Because agreement to production limits would be a major concession to the EC, the U.S. negotiators should seek appropriate concessions from the EC on other points desired by the U.S. In the event of failure to reach consensus on either apparent consumption or combined consumption/production limits, the Group recommends U.S. negotiators consider other alternatives, either a production limit plus principles for "free trade" in CFCs or a "managed trade" approach similar to our current short-supply export controls.

Developing Country Issue

The consensus of the Trade Group is that the developing country problem can be handled by a 7 to 10 year "grace period" during which those countries with low 1986 CFC consumption would be allowed to increase their domestic consumption. At the end of this period or when their annual per capita consumption reached the level established in the protocol (whichever occurred first), these countries would be subject to the same schedule of freeze and reduction of their production and/or consumption as developed countries. To discourage the construction of new production capacity in these countries, existing producers would be allowed to export CFCs to these countries using existing CFC capacity without being subject to production limits otherwise imposed. The developing countries, in turn, would have to use the supply made available under this temporary exception only for domestic consumption and not for increasing their exports above 1986 levels. The Group believes, based on analysis of projected ozone depletion under various assumptions, that the additional emissions associated with developing country growth under this temporary grace period would not have a significant effect on overall ozone depletion as long as these countries were subject to the protocol limits following this period. The Group is still considering what the appropriate per capita consumption level should be and how specific countries would be affected.

Trade with Non-Parties

In view of the "carrot" represented by the special treatment for developing countries which the Trade Group believes the U.S. can support, the Group feels the U.S. should continue to press for a strong "stick" in the form of a protocol article authorizing trade sanctions against CFC and related imports from countries which do not join or comply with the protocol provisions. Such sanctions would be consistent with GATT Article XX:(b) and XX:(g) and would be necessary from both an environmental and an economic point of view. If non-parties were able to increase their CFC emissions without constraint by selling either bulk chemicals or products containing or made using these chemicals to the large markets of the protocol countries, this could undermine the protocol objective of protecting the stratospheric ozone layer. In addition, these non-parties would benefit commercially from taking over a portion of the protocol country markets thus made attractive by the limits imposed on protocol member industries. The Group is aware that there are serious administrative (and possibly foreign policy) problems associated with actual implementation of such sanctions and therefore feels the U.S. should not commit to implementation of sanctions beyond bulk chemical imports without an opportunity to consider these implications. On the other hand, the Group also feels that the protocol should send a strong signal to other countries that they will not be permitted to benefit commercially through trade with parties by not joining the protocol.

Negotiating Strategy

The Trade Group recognizes that different countries will be coming to the next round of negotiations with various points of view and strategies for obtaining their objectives. The positions outlined above represent the Group's recommendations regarding U.S. "bottom-line" positions which the negotiators should seek to achieve by the end of the session. In the course of the negotiations, the Group anticipates that the U.S. team may need to take certain interim "hard-line" positions in order to counter opposing positions by other countries. In doing so, the negotiators should seek appropriate concessions from other countries before agreeing to some of the compromise positions described above.

Article VI: Reporting of Information

1. Each Party shall submit annually to the Secretariat data showing its calculation of aggregate annual emissions of fully-halogenated alkanes, as specified in Article III, using the format developed by the Secretariat pursuant to paragraph 3a.

2. Each Party shall submit to the Secretariat appropriate information to indicate its compliance with Article V.

3. The Secretariat shall:

   a. develop and distribute to all Parties a standard format for reporting such data as indicated by paragraph 1;

   b. take appropriate measures to ensure the confidentiality of all data submitted to it pursuant to paragraph 1, except for the aggregate annual emissions figures;

   c. compile and distribute annually to all Parties a report of the aggregate annual emissions figures and other information submitted to it pursuant to paragraph 2.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

March 23, 1987

SAB-EC-87-025

OFFICE OF
THE ADMINISTRATOR

Honorable Lee M. Thomas
Administrator
U. S. Environmental Protection Agency
401 M Street, S. W.
Washington, D. C. 20460

Dear Mr. Thomas:

The Science Advisory Board's Stratospheric Ozone Subcommittee has completed its review of EPA's risk assessment document entitled An Assessment of the Risks of Stratospheric Modification and is pleased to transmit its final report to you.

The Subcommittee carried out an independent evaluation of the assumptions, conclusions and interpretations used by EPA in assessing the existing scientific information related to stratospheric ozone modification. The Subcommittee also advised EPA on the thoroughness and balance of its treatment of particular scientific issues, noting areas of omission as well as areas emphasized in the assessment document, and reviewing EPA's characterization of scientific uncertainties.

EPA's draft assessment document represents an extensive effort to develop an integrated risk assessment, based upon currently available scientific information, to ascertain the potential threat to the stratosphere posed by a continued growth world-wide of emissions of chlorofluorocarbon compounds (CFCs). The Subcommittee generally finds that EPA had done a commendable job in the body of the report of assembling the relevant scientific information, although the Subcommittee has many recommendations for improving the document. The uncertainty in future CFC emissions has been characterized in the EPA draft as encompassing a range of 0 to 5% for annual emissions growth, with 1-4% as the most likely portion of the range. The Subcommittee recommends that EPA present the 2.5% growth rate as one of a series of illustrative "what-if" scenarios, rather than as a most likely case. The revised Executive Summary adopts this advice.

Depletion of the ozone column can increase ultraviolet radiation (UVB), resulting in an increase in nonmelanoma skin cancer. Available scientific evidence suggests that melanoma may also increase as a result of increased ultraviolet radiation. There may be other significant health effects, in addition to adverse impacts on plants and aquatic organisms. Information on the impacts of increased ultraviolet radiation on plants and aquatic organisms is extremely limited. The Subcommittee believes that the potential for adverse impacts on plants and aquatic organisms is sufficiently large to warrant high priority for further investigation.

The Subcommittee believes that the information summarized in the draft risk assessment supports the conclusion that the possible impact of CFCs on the stratosphere should be considered a high priority issue for further investigation and analysis by EPA and other Federal agencies, and provides a scientific basis for the recently initiated international efforts to address this problem.

The Subcommittee reviewed the first draft of the entire assessment document during its initial meeting. Following that session, using comments received from members of the Subcommittee and the public, EPA staff rewrote the Executive Summary. This revision was resubmitted in time for the Subcommittee's second meeting. The Subcommittee's report, therefore, provides scientific advice on the revised Executive Summary and the first draft of the individual chapters of the assessment document. The Subcommittee members have not seen revisions to the individual chapters and request that EPA staff transmit the revised chapters and any further revision of the Executive Summary for their individual review once this task is completed. Following this individual member cycle of review, the Chair and Vice Chair will transmit a letter to EPA noting the extent to which the Agency has responded to its scientific advice.

We appreciate the opportunity to participate in the evaluation of this important public health and environmental issue. We request that the Agency formally respond to the scientific advice provided in the attached report.

Sincerely,

Margaret Kripke

Margaret Kripke
Chair
Stratospheric Ozone Subcommittee
Science Advisory Board

Norton Nelson

Norton Nelson
Chair
Executive Committee
Science Advisory Board

cc: A. James Barnes
Jack Campbell
Vaun Newill
Craig Potter
Terry F. Yosie

SAB-EC-87-025

REVIEW OF EPA'S

AN ASSESSMENT OF THE RISKS OF STRATOSPHERIC MODIFICATION

BY THE

STRATOSPHERIC OZONE SUBCOMMITTEE

SCIENCE ADVISORY BOARD

U. S. ENVIRONMENTAL PROTECTION AGENCY

March, 1987

U. S. ENVIRONMENTAL PROTECTION AGENCY

NOTICE

This report has been written as a part of the activities of the Science Advisory Board, a public advisory group providing extramural scientific information and advice to the Administrator and other officials of the Environmental Protection Agency. The Board is structured to provide a balanced expert assessment of scientific matters related to problems facing the Agency. This report has not been reviewed for approval by the Agency, and hence the contents of this report do not necessarily represent the views and policies of the Environmental Protection Agency, nor of other agencies in the Executive Branch of the Federal government, nor does mention of trade names or commercial products constitute endorsement of recommendation for use.

U. S. ENVIRONMENTAL PROTECTION AGENCY
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I. Introduction

A. Scope and Charge of the Subcommittee's Review

On January 9, 1986 EPA's Assistant Administrator for Air requested the Science Advisory Board to evaluate the Agency's assessment of the risks of stratospheric modification. Specific questions posed to the Board included reviewing and assessing EPA's treatment of the scientific issues of concern (e.g., long term trends in trace gases, atmospheric science, and health and ecological effects from ozone depletion).

On January 31, 1986 the Science Advisory Board Executive Committee accepted this request and authorized the formation of a Stratospheric Ozone Subcommittee to conduct the review. The Subcommittee's role was to carry out an independent evaluation of the assumptions, conclusions and interpretations developed or used by EPA in assessing the existing scientific information related to stratospheric ozone modification. The Subcommittee also advised EPA on the thoroughness and balance of its treatment of particular scientific issues, noting areas of omission as well as areas emphasized in the assessment document, and reviewing EPA's characterization of scientific uncertainties.

The Subcommittee's primary effort was directed at examining the scientific logic used by EPA in its efforts to synthesize the available scientific literature. While it conducted a chapter-by-chapter review of the assessment document, the Subcommittee recognizes that not all of the issues discussed in each chapter are of equal public health or environmental importance.

At no time did the Subcommittee believe that its role was to assist EPA in writing the assessment document. Instead, it has offered specific technical advice for improving the scientific quality of the document. EPA

must then decide whether to accept or not accept this advice. The Subcommittee also construed its role as an advisor rather than as a final approval body that would supervise detailed editorial and factual changes to all sections of the document. The latter role was beyond the Subcommittee's resource capability and was also inconsistent with the role of an advisor performing a timely review.

B. Subcommittee Review Procedures

The Subcommittee met twice in public session in Washington, D. C., on November 24-25, 1986 and January 26-27, 1987. Notice of each meeting was published in the Federal Register. During its meetings the Subcommittee heard presentations from EPA staff and had the opportunity to provide both verbal and written criticisms of the material submitted for review. In addition, the Subcommittee made time available for members of the public to present verbal and written comments on the scientific adequacy of EPA's assessment document. Participating organizations included the Alliance for a Responsible CFC Policy, Chemical Manufacturers Association, Dupont Corporation, Environmental Defense Fund and Natural Resources Defense Council, as well as individual members of the scientific community. These presentations, and the interactions between the Subcommittee and EPA staff, resulted in a wide ranging scientific dialogue whose aim was to solicit information and facilitate the Subcommittee's effort to achieve consensus on the major issues for which it was advising EPA.

The Subcommittee reviewed the first draft of the entire assessment document during its initial meeting. Following that session, using comments received from members of the Subcommittee and the public, EPA staff rewrote the Executive Summary. This revision was resubmitted

in time for the Subcommittee's second meeting. The Subcommittee's report, therefore, provides scientific advice on the revised Executive Summary and the first draft of the individual chapters of the assessment document.

Following its first meeting, the Subcommittee drafted an interim report that summarized its major thoughts at that stage of the review. This was expanded and updated at the second meeting. Final editing of the report was carried out by mail and telephone conversations. The Science Advisory Board's Executive Committee approved the report by mail on February 25, 1987.

The Subcommittee members have not seen revisions to the individual chapters and request that EPA staff transmit the revised chapters and any further revision of the Executive Summary for their individual review once this task is completed. Following this individual member cycle of review, the Subcommittee Chair and Vice-Chair will transmit a letter to EPA noting the extent to which the Agency has responded to its scientific advice.

II. General Comments and Conclusions

EPA's draft document represents an extensive effort to develop an integrated risk assessment based upon currently available scientific information to ascertain the potential threat to the stratosphere posed by a continued growth world-wide of emissions of chlorofluorocarbon (CFCs) compounds. The Subcommittee generally finds that EPA has done a commendable job of assembling the relevant scientific information in the body of the document, although the Subcommittee has many specific recommendations for improving the treatment of particular scientific issues and characterizing scientific uncertainties.

EPA states the uncertainty in future CFC emissions as encompassing a range of 0 to 5% for annual emissions growth, with 1-4% as the most likely scenario within the range. The Subcommittee recommended that EPA

present the 2.5% growth rate as one of a series of illustrative "what-if" scenarios, rather than as a most likely case. The revised Executive Summary adopts this advice.

Calculations with one and two dimensional atmospheric models indicate that continued CFC annual emissions growth of 2.5% or above could lead to depletion of global column ozone by several percent within the next forty years and much higher reductions in subsequent decades if this rate of CFC emissions growth continues. Ozone reduction will continue, albeit at a slower rate even if the rate of emissions becomes constant. The retention time of CFC gases in the atmospheric is decades to centuries, so that the CFC buildup cannot be quickly reversed once it has occurred. The impacts of ozone depletion will be largest at high latitudes and at high elevations of the stratosphere, although changes in ultraviolet radiation will be determined by column ozone (total ozone in a column through all levels of the atmosphere).

Changes in CFC gases interact with changes in greenhouse gases (CO_2, N_2O, CH_4) in determining changes in ozone concentrations. The impact of CFC emissions on ozone concentrations may be even larger if growth in these greenhouse gases is reduced from current trends. In addition, CFC gases have a potential impact on global climate, although this impact appears to be only about 20 percent of that anticipated from changes in CO_2, N_2O, and CH_4. The impact on climate of changes in ozone concentration appears to be small by comparison.

Depletion of the ozone column can increase ultraviolet radiation (UVB), resulting in an increase in non-melanoma skin cancer. Available scientific evidence suggests that melanoma may also increase as a result of increased ultraviolet radiation. There may be other significant health

effects, in addition to adverse impacts on plants and aquatic organisms. Information on the impacts of increased ultraviolet radiation on plants and aquatic organisms is extremely limited. The Subcommittee believes that the potential for adverse impacts on plants and aquatic organisms is sufficiently large so that further research of these areas should receive high priority.

The Subcommittee believes that the information summarized in the draft risk assessment supports a conclusion that the possible impact of CFCs on the stratosphere should be considered a high priority issue for further investigation and analysis by EPA and other Federal agencies, and provides a scientific basis for the recently initiated international efforts to address this problem.

The draft document represents a useful step toward communicating the applicable scientific information to decision makers, but decisions on CFC regulations will require further analysis of the regulatory options beyond the analyses presented in the draft risk assessment.

The Subcommittee has reviewed, but has not evaluated in detail, the quantitative projections of health and other impacts associated with growth in CFC emissions that are contained in the draft risk assessment. The integrating model appears to be a useful vehicle for summarizing the implications of alternative assumptions regarding emissions, atmospheric response to CFCs and other trace gases, implications for changes in ultraviolet radiation, and consequent changes in the incidence of skin cancer in the U. S. population during the lifetimes of the current population and those individuals born during the next century. Some other impacts (e.g., economic costs of damage to polymeric materials, soybeans as an example of crop loss, and anchovy loss as an example of

population impact for a sensitive aquatic species) are included in the quantitative analysis using the integrating model. Many potentially important impacts are not included since the information to support quantitative projections of these impacts is not yet available.

The draft document makes a reasonable attempt to characterize uncertainties in scientific knowledge and in the assumptions for growth of CFC emissions. The Subcommittee recommends further efforts to state assumptions more explicitly and to more clearly characterize the limits of currently available information.

The draft document is long and repetitive and, yet, some critical information is not readily available. As an example, much of the discussion of CFC emissions' projections in Chapter 3 presents results with little information on underlying assumptions and data. EPA has taken these results from contractor reports that are not available in the peer reviewed literature. It is highly desirable that the final document, with its appendices, be self-contained and reasonably complete. Additional appendices summarizing contractor work and documenting more fully the integrating model of Chapter 17 may, therefore, be needed.

In summary, the entire draft document represents a good first effort to summarize an exceedingly complex set of issues, and the Subcommittee commends EPA for the progress achieved to date.

III. Specific Comments on the Revised Executive Summary

The Subcommittee believes the Executive Summary is extremely important because it is likely to receive the most attention and will be used for a variety of purposes, including domestic regulatory decision making and international negotiations. For this reason, the Executive Summary needs to be accurate and explicit, and provide a balanced overview of the

content and conclusions of the entire assessment document. The Subcommittee spent most of the time at its second meeting reviewing and discussing this portion of the document. It reached the following conclusions and recommendations:

1. The revised Executive Summary represents a marked improvement over the original version. Our major criticism of the original Executive Summary was its failure to reflect accurately and objectively the content of the individual chapters in the report. EPA staff have made significant progress in correcting this problem.

2. Additional revisions are still needed to reach the necessary level of accuracy, balance and clarity. The Subcommittee recommends that both the findings summary and the chapter summaries be organized into subsections to facilitate their presentation. All long headings in the chapter summaries should be shortened to a brief sentence. The document should also present an outline or diagram illustrating the atmospheric processes involved in the creation and destruction of ozone. Many specific suggestions for improvement of the Executive Summary were discussed with or submitted in writing to Mr. John Hoffman for incorporation into a second revision of the Executive Summary.

3. Although the Executive Summary is now more accurate and objective in describing the information and conclusions of the entire document, statements interpreting the results for non-scientists, and indications of the relative importance of the issues considered, need to be provided. For example, each point made in the Executive Summary appears to be given equal weight, when clearly, the issues differ widely in terms of their potential significance. Specific recommendations for addressing this problem include:

a) EPA should clearly and forcefully state that, by the time it is

possible to detect decreases in ozone concentration with a high degree of confidence, it may be too late to institute corrective measures that would reverse this trend.

b) Predictions of ozone depletion derived from atmospheric models are consistent, in most instances, with actual measurements of ozone concentration, even though these measurements are subject to considerable uncertainty.

c) Both the relative state of knowledge, and our ability to obtain new information in the immediate future are different for each area summarized in the document. For some issues, it will take decades to obtain missing information whereas, on others, rapid progress can be predicted. However, this variation in the information base should not preclude recognition of the potential problem of ozone depletion or making decisions that address the problem. Decisions can and should be made, even in the face of current uncertainties.

d) The Executive Summary should provide a sense of proportion and balance among the scientific issues evaluated, particularly in presenting the findings of the document. Clearly, the consequences of ozone depletion could be major for some effects, even though the amount of information available is small. A large amount of information does not necessarily imply greater importance compared to the effects on which little information is available. EPA should attempt to prioritize the effects that might result from ozone depletion and to distinguish between effects that are of greater or lesser consequence on a global scale. The following table is provided to illustrate the Subcommittee's view of the relative significance and state of knowledge for each of the effects summarized in the report:

Effect	State of Knowledge	Potential Global Impact
Skin Cancer	Moderate to high	Moderate
Immune System	Low	High
Cataracts	Moderate	Low
Plant Life	Low	High
Aquatic Life	Low	High
Climate Impacts*	Moderate	Moderate
Tropospheric O_3 and H_2O_2	Moderate	Low
Polymers	Moderate	Low

* Contribution of O_3 to climate changes, including sea level rise

A principal use of this table could be as a guide to research planning, especially in conducting research for effects where current knowledge is low and potential global impacts are high. Such a table is, however, an imperfect guide for allocating research dollars, and is subject to change as new information becomes available.

The Subcommittee does not know, based on current knowledge, whether effects with a potential global impact designated as "high" with a state of knowledge designated as low will occur but, if such effects are experienced, they could be significant.

e) The Executive Summary should devote less emphasis to climate change and its effects, such as sea level rise. It should focus, instead, on the contribution of changes in ozone concentration to climate modification, rather than reviewing all the radiatively-active gases that affect climate. We recognize that the ozone depletion and global warming (greenhouse) issues are linked; nonetheless, the emphasis in this document should be placed on stratospheric, rather than tropospheric processes.

IV. Specific Comments on Individual Chapters

Chapter 1: Goals and Approach

This short introductory chapter was not formally reviewed. The

Subcommittee endorses the statement of purpose for the risk assessment.

Chapter 2: Stratospheric Perturbants: Past Changes in Concentrations

This chapter on past changes in concentration of stratospheric perturbant gases is generally acceptable as written. The discussion of CO should be strengthened, and additional discussion of volcanic gases and trace gas lifetime may be appropriate. The more accurate term "steady-state" should be used instead of "equilibrium." EPA may wish to move the discussion of atmospheric response dynamics (page 2-21 to page 2-25) into Chapter 5, or elsewhere, as a part of the discussion on modeling stratospheric response to perturbant gases.

Chapter 3: Emissions of Ozone Modifiers

At the Subcommittee's request, EPA developed a set of "what-if" scenarios to explore the range of reasonable outcomes for future CFC world production. In addition to cases with constant growth rates in the range of 0-5% annually, EPA considered cases with near-term growth followed by a leveling off and decrease in production levels. EPA should seek assumptions and additional insights to characterize the CFC uses that may cause high future demand for CFCs, such as widespread use of air conditioning and refrigeration in developing nations, as opposed to describing scenarios only in terms of annual growth rate. Characterization of the potential for substituting in various CFC uses may provide a means of developing insight on the relative likelihood of the production scenarios. Given the importance of the uncertainty in future world CFC production levels on the projected timing and magnitude of stratospheric ozone changes, further research on CFC uses and their alternatives is highly desirable.

Chapter 4: Future Emissions and Concentrations of Trace Gases

As in Chapter 3, a central case for the growth of CO_2 and other

greenhouse gases may project a misleading impression of current ability to predict the future evolution of atmospheric conditions. The EPA responded to the Subcommittee's suggestion to explore a set of scenarios and a range of plausible future conditions. However, insights on the potential role of fossil fuel uses, changes in deforestation, and other factors underlying changes in greenhouse gas levels should be described. Uncertainty on non-anthropogenic emissions and resulting uncertainties in the trends for CH_4 and N_2O should be discussed further. This chapter could benefit from extensive rewriting and reorganization.

Chapter 5: Assessment of the Risk of Stratospheric Ozone Modification

The discussion of one dimensional (1-D) models should be condensed, while more discussion of two dimensional (2-D) models and perhaps three dimensional (3-D) modeling approaches would be useful in explaining the current understanding of the complex set of relationships determining ozone levels and climate changes. It is crucial to communicate the extent of predictive power of current models. We recognize the need for improved models that can describe seasonal and regional changes in ozone abundance and the resulting climatic changes.

The Monte Carlo analysis of Stolarski and Douglas indicates that screening sets of variables to combinations that are reasonably consistent with available atmospheric measurement data changes the character of the results as stated in the Executive Summary and the findings of Chapter 5. The discussion on pages 5-88 and 5-93 with Figures 5-57 and 5-58 should become the basis for revising the statement of these results. The choice of material for the chapter summary should be improved. The chapter could benefit by extensive editing and rewriting.

Chapter 6: Climate Change

The Subcommittee judged this to be one of the better written chapters, providing a balanced summary of the available scientific information on climate change. However, the focus of the chapter should be the contribution of changes in ozone concentration from climate modification, rather than a review of all the radiatively-active gases that affect climate. The chapter should place more emphasis on stratospheric, rather than tropospheric processes. Linkages between ozone concentration changes and climate change should be highlighted, and more attention paid to the effect of changes in the vertical distribution of ozone to climate impacts. A separation of direct and indirect effects would be useful. The chapter should focus on the direct effects of ozone on climate, and briefly summarize the indirect effects of trace gases whose concentrations affect both ozone concentration and climate.

The document should define the eddy diffusion coefficient. The discussion of the importance of cloud cover in determining heat balance should be expanded to at least half a page. More discussion of sensitivity analysis and comparison of 1-D and 2-D model results would be appropriate, and some discussion of further research using 2-D models to explore sensitivity issues would be a useful addition to the chapter. Ocean thermal lag is another important issue for determining climate response and could use more discussion. Absolute concentration information should be added to exhibit 6-3.

Chapter 7: Nonmelanoma Skin Cancer

The Subcommittee generally agrees that this chapter is concise, comprehensive, and well written. No deficiencies were noted in the

breadth of the material reviewed in this chapter. The Subcommittee concurs that considerable evidence supports the conclusion that increased UVB would increase the incidence and mortality of nonmelanoma skin cancer. Specific errors in the text were noted and discussed with appropriate staff members.

Points requiring revision or remaining to be addressed in the body of the text are the following:

1. There needs to be a clear statement of the potential impact of increased UVB radiation on mortality from basal cell carcinoma and squamous cell carcinoma.

2. The document should present a discussion of the validity of existing mortality data for nonmelomma skin cancer and justification for not basing predictions on these data.

3. The action spectra discussed in the chapter should be presented diagrammatically. These include the action spectra for DNA, the modified DNA action spectrum corrected for skin transmission, the RB meter action spectrum, the cutaneous edema action spectrum, and the ereythema action spectrum.

4. The chapter should justifiy the selection of the action spectra used in the calculations.

5. The major problem with this chapter concerns the translation of information within the chapter into statements concerning the expected numbers of additional cancer cases and additional cancer deaths. The Subcommittee requested an addendum that contains a list of the assumptions underlying the calculated increases in cancer incidence and mortality and some indication of the uncertainties contained within these predictions. This addendum was received, and information from it needs to be incorporated into the chapter. The addendum itself should be included in the appendix.

6. The Subcommittee earlier suggested that a range of values for incidence and mortality be utilized that would reflect predicted upper and lower limits of increased UVB exposure, rather than using the central case values. The staff have adopted this suggestion in the revised Executive Summary; it needs to be incorporated in Chapter 7.

Chapter 8: Melanoma

In general, the Subcommittee agrees that this chapter provides a comprehensive analysis of the evidence for and against the role of sunlight and UVB radiation as a contributing factor in the development of cutaneous melanoma in humans. Although there are still many uncertainties concerning the relationship between UVB and melanoma, the weight of current evidence, especially that provided by recent epidemiologic studies, favors the conclusion that increased UVB radiation is likely to increase the incidence and mortality of cutaneous melanoma in humans.

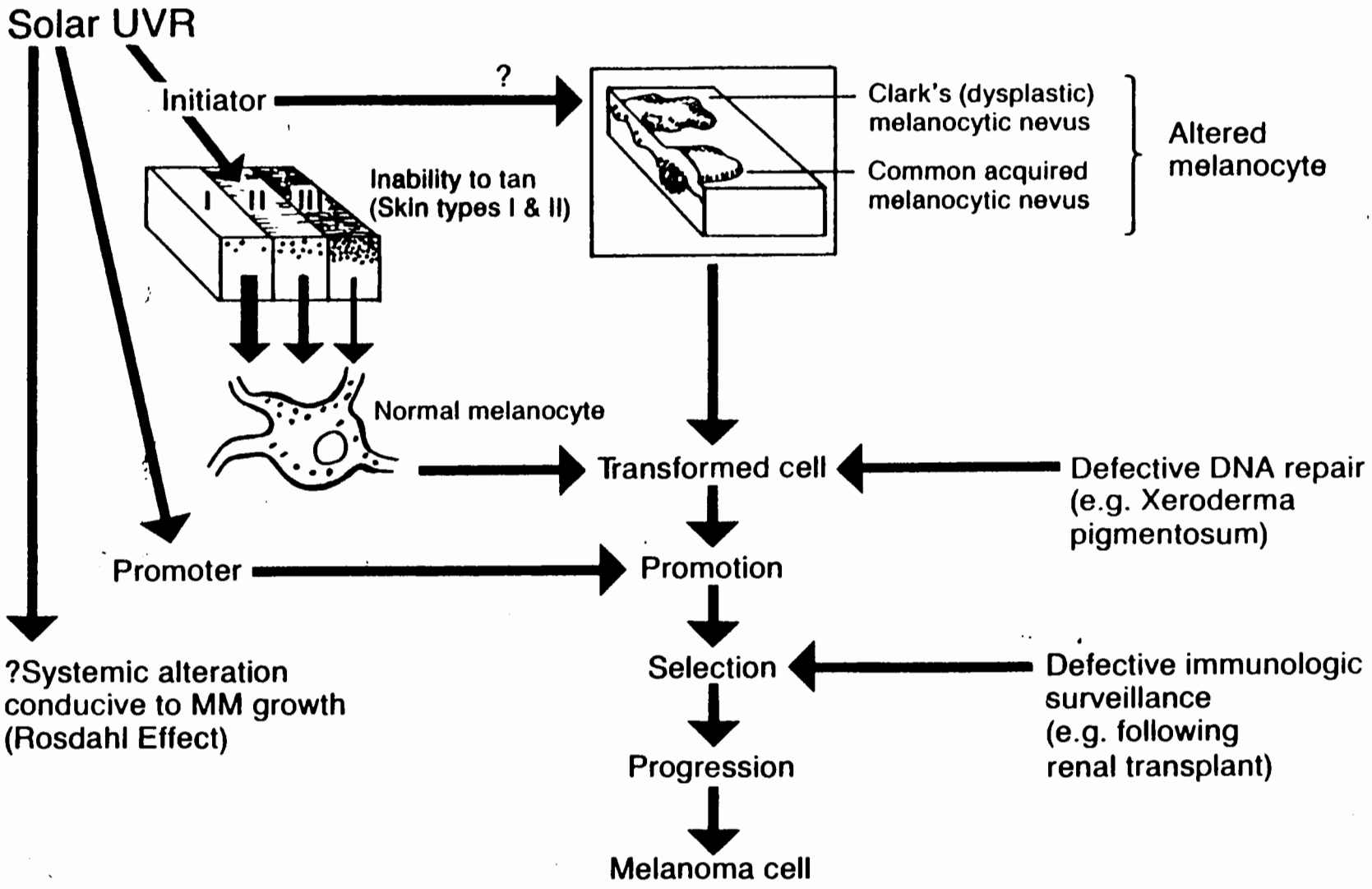
The points remaining to be addressed in this chapter are the following:

1. The staff has provided a statement of the assumptions underlying the calculated increases in the incidence and mortality of melanoma to the Subcommittee, along with justifications for the choice of critical assumptions. This information needs to be incorporated into the chapter.

2. Two concepts need to be addressed in a revised chapter. The first is that UVB radiation could contribute to the incidence and mortality of melanoma without being a direct, causative agent responsible for the transformation of normal melanocytes into cancer cells. The chapter presently considers only the likelihood that UVB is a direct, causative agent that induces cutaneous melanoma (See Figure 1). Second, the chapter should emphasize that the term "melanoma" may actually encompass

FIGURE

Solar Ultraviolet and Malignant Melanoma of the Skin*



*in the white population

a heterogeneous group of disease entities. The possibility that there may be subsets of cutaneous melanoma that are caused, exacerbated or completely unrelated to UVB should be raised in seeking explanations for the obscure relationship between sunlight exposure and melanoma incidence.

3. Material included in this chapter as background information (pp. 8-7 to 8-13) also applies to chapter 7 and should be moved to the beginning of chapter 7 and integrated with the information on action spectra.

4. The statements on the evidence supporting the conclusion that solar radiation is one cause of melanoma (p. 8-4) need to be revised to reflect more accurately the available scientific information.

Chapter 9: Immune System

The Subcommittee concurs with the general summary and conclusions reached in this chapter. Specifically, there is reason to believe that UVB radiation has the potential to modify immune responses in humans and that such modifications could conceivably increase the incidence or severity of some infectious diseases.

In general, the chapter is not well written or well organized, and the Subcommittee made many detailed suggestions concerning appropriate revision of the material to increase both its accuracy and its clarity. However, the suggested revisions would not alter the general conclusions.

The Subcommittee notes several deficiencies in the presentation of the work that require revision. They include:

1. The chapter does not clarify the fact that several different immunologic consequences of UVB irradiation occur, each of which may have a different action spectrum. The available action spectra should be illustrated in a figure.

2. The document should state that UVB exposure produces systemic immunologic changes, as well as local changes within irradiated skin. Restricting consideration to cutaneous infections may represent too narrow a view of the potential consequences of increased UVB irradiation.

3. This chapter should state that, although UVB induced effects on the immune system might contribute to the induction and pathogenesis of skin cancers, this fact is not likely to increase the predicted estimates of increases in skin cancer incidence and mortality.

4. A point needing further emphasis is that most immunologic studies to date have not assessed the effects of long-term, chronic UVB irradiation, but have concentrated on acute effects.

Chapter 10: Cataracts

The chapter on cataracts and other eye disorders is comprehensive and extremely well written. The Subcommittee does not believe that any major study has been omitted in the bibliography, and EPA's assessment of each paper appears to be accurate and balanced.

The findings are accurately stated and succinctly express the legitimate concern that an increase in the flux of the UVB radiation may lead to an increase in cataract incidence around the world. The Subcommittee agrees with these findings and with the Agency's method of presenting them.

Near the end of the chapter, the document emphasizes the effect of UVB radiation on the DNA content of lens cells. This represents an important point that is well treated in the chapter. Researchers have emphasized the effect of irradiation on lens protein, and there has been relatively little discussion of the impact of UVB radiation on lens DNA.

The selection of epidemiologic studies relevant to this issue is correct and well presented. A major limitation which EPA staff may wish to address is that all of the studies are handicapped by the lack of an individual dose meter to measure the ultraviolet exposure on a case by case basis. To date, we have not had such an instrument for use in prospective studies and, therefore, have relied on general radiation levels at different latitudes to estimate the exposures of individuals living at those latitudes.

The discussion of the multifactorial nature of senile cataract formation is accurate. Within one to three years, three major studies of the risk factors in senile cataract formation will be completed in Boston, Parma, Italy and Delhi, India. These studies will also indirectly address the question of ultraviolet exposure and cataract type and severity.

Chapter 11: Terrestrial Effects

The Subcommittee agrees that this chapter presents a balanced overview of available material. The only concern is that the summary statements for this chapter are not balanced and tend to emphasize the negative aspects of the material.

This chapter reviews the available information concerning UVB radiation effects on plants as this relates to the question of potential effects of ozone reduction. Ultraviolet screening tests with agricultural species and cultivars, as well as actual field trials using UV lamps, are described.

Complicating factors such as the appropriate action spectra to use in evaluating ozone change and effects of UV lamp supplementation on the resulting ozone reduction simulations, plant acclimation to enhanced UV

radiation, and interactions with other environmental factors such as drought and carbon dioxide enhancement are discussed. Interpretation of the data and caveats concerning limitations in drawing conclusions from these data are offered.

Overall, the text, considering the length allotted, is reasonably complete and balanced. On the other hand, the summary tends to accentuate results supporting the detrimental effects of ozone reduction. This results in a statement of findings and a summary which are much less balanced than the text itself.

Chapter 12: Aquatic Effects

This is a very thorough, well written chapter. It accurately conveys the extant information on the effects of solar ultraviolet radiation on aquatic systems and explains the difficulties in extending these data to an assessment of the effects of stratospheric ozone reduction. There are a few passages describing laboratory experiments where it is not clear whether the ultraviolet radiation simulating a certain ozone reduction is calculated as that striking the water surface or at some depth in the water. Occasionally, experimental results are not always clearly distinguished from calculated impacts. We believe the issue of large migrations of aquatic populations, e.g. 30° latitude, while illustrative, are unrealistic and could be misleading. These could be eliminated without detracting from the content of the chapter.

As with Chapter 11, assessing the impacts of stratospheric ozone reduction on communities and ecosystems has received less attention and research than issues such as skin cancer. The Subcommittee believes the potential impacts on aquatic and terrestrial food chains, and the potential

effects on the equilibrium of plant and animal assemblages, are just as important as the more intensively studied human effects. This importance needs to be conveyed not only in Chapters 11 and 12 but also in the summaries of these chapters and in the Executive Summary.

Chapter 13: Polymers

The economic analysis on polymer damages is based on the assumption of a small increase in the destruction rate of the polymer material multiplied by a large value for the inventory of material in place. The assumptions of the analysis should be stated more clearly, and the uncertainities in this economic analysis should be highlighted. Discounting future damages should be discussed.

The rate of polymer degradation depends on the actual action spectrum, which is undoubtedly different for each kind of polymer. These spectra should be measured experimentally before any confidence can be placed in the predictions. In many cases, it would be expected that UVB contributes only a small fraction of the total rate and, therefore, the rate would be very insensitive to changes in stratospheric ozone.

The estimates presented by EPA are reasonable in the absence of real data, but the required measurements are not difficult and should be made.

Chapter 14: Potential Effects on Tropospheric Ozone

The document should present a more extensive introduction to the discussion of health and welfare effects of tropospheric ozone. The modeling discussion now found on page 14-11 should be expanded and placed near the front of the chapter. The material on page 9 should be shown as a graph. All three cities should be shown in the figure, page 14-12. The word "smog" is colloquial and should be avoided. The discussion of

the spectral resolution of UV needed for photochemistry should be strengthened. The question of what happens to global tropospheric ozone as UVB increases needs expanding (some discussion of this issue is found in Chapter 5). The limitations of the analysis in this chapter should be stressed more. The effect of CFC emissions reductions on tropospheric ozone should be discussed. Discussion of mass flux and other interactions between the troposphere and stratosphere should be added.

Chapter 15: Sea Level Rise

The Subcommittee reached a consensus that this chapter adequately covers the subject material. However, additional qualifying statements need to be added to the summary statements.

This chapter requires more careful caveats in the summary and findings and references to major reports on sea level rise. Assumptions should be clearly stated. The range of 50-200 cm. of sea level rise seems narrow in view of the many uncertainties on climate change, and the basis for calculating this range should be made explicit. The implications for loss of land of a 1 meter rise might be stated.

More discussion of the economic aspects of sea level rise would be desirable.

Chapter 16 and Appendix B: Impacts of Climate Change

The discussion focuses mainly on North America and Europe. The Subcommittee encourages the staff to present more information on the rice crop and other aspects of agriculture in the developing world. The document should emphasize that uncertainty in the regional effects is substantial. Catastrophic episodes such as floods, droughts, and severe storms may cause much of the damage, and these episodes cannot be reliably predicted.

This chapter represents a compilation of potential consequences of global warming. These synoposes address potential changes in forest and other vegetation distributions, agricultural implications, hydrological cycles and weather effects on morbidity and mortality. This collection of vignettes is, of course, one of only many possible compilations since global warming can have many ramifications.

Chapters 17 and 18: Integrating Model and Results

The objective of the integrating model is to provide a framework within which the implications of alternative assumptions and policies can be identified. The Subcommittee finds this objective commendable and supports EPA's effort to make the assumptions and the logic used in the risk assessment explicit and readily available to interested members of the public. The integrating model appears to be a good vehicle for summarizing the assumptions and calculations described in previous chapters of the risk assessment. An integrating model such as this represents an excellent tool for examining the implications of alternative assumptions--"what if" scenarios--and for investigating the importance of uncertainties in different areas of science for policy and research conclusions.

The logic and implementation of the integrating model as a computer code were the subject of a factfinding meeting of four members of the Subcommittee on January 14, that also included John Hoffman of EPA, and representatives from EPA's contractor, ICF. Prior to the meeting, these Subcommittee members received a listing of input files and the FORTRAN computer code for the model. Other technical documentation for the model does not exist at this time. Based on the written material in Chapter 17 and the discussion at this meeting, the Subcommittee believes that the model, and the results of the model calculations presented in Chapter 18, appear

reasonable. However, the model has not undergone detailed review outside of the EPA/ICF team that developed it, and it has not been documented and placed in a form accessible to outside parties.

The material in Chapters 17 and 18 will need substantial revision as the analysis with the integrating model is revised to meet recommendations from the Subcommittee regarding the Executive Summary and the other chapters. The revised versions of Chapter 17 and 18 should stress the structure of the model and the insights obtained from the analysis that has been carried out using the model, including: what issues were addressed and not addressed in the model, and how issues not included in the integrating model could affect overall conclusions. The sensitivity analysis and the interpretation of the sensitivity analysis should be expanded, and conclusions on the importance of uncertainty in various areas of science made more explicit. What areas of science are most significant for policy conclusions and as targets for future research? As one example, the Subcommittee judged that impacts on plants and aquatic organisms are among the most important potential effects of ozone depletion, yet these impacts are included in the model only by considering changes in one crop, soybeans, and one species of aquatic organisms, anchovies. More comprehensive quantitative assessment of potential impacts on plants and aquatic organisms should be identified as a target for further research and analysis as the risk assessment methodology is further refined. As another example, the integrating model does not include mechanisms relating to the recent observations of ozone depletion over Antarctica. As a result, it would be inappropriate to cite the results of the model as indicating that changes exceeding a few percent in stratospheric ozone concentration will not take place until well into the next century.

The integrating model should have extensive additional technical documentation. A listing of the FORTRAN code is inadequate as a basis for communicating the details of the model. Many parties interested in stratospheric ozone risk assessment may find it valuable to have access to the integrating model in order to carry out analyses of the impacts of CFC emissions on ozone and climate change. The Subcommittee recommends that EPA provide adequate technical documentation of the integrating model in the form of appendices to the risk assessment, and that EPA include in its future plans the development of a "user-friendly" version of the integrating model that can be placed in the public domain for use by others.