WORLD METEOROLOGICAL ORGANIZATION

CLOUD PHYSICS AND WEATHER MODIFICATION RESEARCH PROGRAMME

(WMP Report No. 13)

REGISTER OF NATIONAL WEATHER MODIFICATION PROJECTS 1987 AND 1988

Technical Document
WMO/TD - No. 330

NOTE

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W O R L D M E T E O R O L O G I C A L O R G A N I Z A T I O N

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Geneva, June 1990

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I. INTRODUCTION

As part of the Weather Modification Programme approved by the Seventh World Meteorological Congress (Geneva, 1975), and re-established as the Cloud Physics and Weather Modification Research Programme by the Tenth Congress (1987), the Secretary-General maintains a Register of experiments and operations in weather modification carried out within Member countries.

The present publication is the thirteenth of its kind and is based on information received from Member countries on experiments and operations sponsored by governmental agencies and private concerns that took place during 1987-1988. For various reasons, the Register does not contain information on all weather modification projects.

The layout and information of the Register has been similar except for the 1982 issue which contained changes. Issues subsequent to 1982 returned essentially to the format and information of the initial issues (with only minor modifications). In this issue, two years 1987 and 1988 are in the same document but kept separate in every respect.

To assist the reader in understanding the contents of each of the 12 columns used in the tabular presentation, detailed explanations are given in Section II. The questionnaire, which was sent to all Members, is reproduced, in Appendix A to the report, in the four official languages of WMO, to ensure that the tabular information will be readily understood by all readers. Information from these questionnaires is given in Part IV. The form to be used in reporting completed programmes or for which a physical and/or statistical evaluation has been carried out is reproduced in Appendix B. However, no reports on completed programmes were received and no information of this nature is included in the 1987-1988 Register.

The list of Members for which information is included in the Register is given in Section III. The Members which replied that no weather modification activities had taken place in their country during 1987-1988 are listed in Section VI.

Requests for further information on the projects may be addressed to the reporting agency for each country which is included in Section V of the Register. The WMO Secretariat will be happy to assist if necessary.

II. DETAILED EXPLANATIONS OF COLUMNS USED IN TABULAR INFORMATION IN THE REGISTER

(The figure in brackets following the column heading title is the similar item in the questionnaire shown in Appendix A).

Column 1: WMO Register No.

This consists of country indicator letters (according to the ISO Standard 3166-1974) and a serial number for each project.

Column 2: Objective of project, type of organization carrying it out (1) and (2)

Dev.	=	Development	PE	=	Precipitation Enhancement
Ext.	=	Extend wet period	(E)	=	Emergency
Fog	=	Fog dissipation	(R)	=	Routine
Hail	=	Hail suppression	PR	=	Precipitation Redistribution
Inc.	=	Increase during wet period	Res.	=	Research
Op.	=	Operational			

Column 3: Approximate size of project area (3)

Given in square kilometers for target and control (if any) areas.

Column 4: Name of project (4)

Reference numbers are also quoted when supplied.

Column 5: Location of project area (5)

In some cases where co-ordinates of several points delineating the area were given, these have been replaced by a single point at approximately the centre of the area. Towns and islands may be denoted by name; A/P = Airport.

Column 6: Year project commenced and continuity (6)

Date	--	year project started
Every year	--	indicates project has operated every year
Interrupted	--	indicates project has not operated every year
No	--	indicates project will not be continued
Yes	--	indicates project will be continued
(?)	--	indicates project status is unknown

Column 7: Nature of organization sponsoring project (7)

Indicated by abbreviations as follows:

Agr.	=	Agricultural	Muni.	=	Municipal
Def.	=	Defense	(P)	=	Private
Enr.	=	Energy	Rec.	=	Recreation
For.	=	Forestry	Res.	=	Research
(G)	=	Government	Trans.	=	Transportation
Hyd.	=	Hydrological	Wea. Ser.	=	Meteorological

Column 8: Apparatus, seeding location (8)

Abbreviations are as follows:

Air	=	Airborne	G/B	=	Ground-Based
A/C	=	Aircraft	Temp.	=	Temperature

Column 9: Agents, dispersal rates (8)

Self-explanatory.

Column 10: Characteristics of clouds treated, seeding criteria (9)

LWC	=	Liquid water content	Temp.	=	Temperature
Obs.	=	Observations			

Column 11: Active period during reporting year (10)

Months of activity are inclusive.

Jan	=	January	July	=	July
Feb	=	February	Aug	=	August
Mar	=	March	Sept	=	September
Apr	=	April	Oct	=	October
May	=	May	Nov	=	November
June	=	June	Dec	=	December

Column 12: Documentation (12) and (13)

"EIS" indicates that an environmental impact study has been made;
"C/B" indicates that a costs and benefits analysis has been made.

III-LIST OF COUNTRIES REPORTING 1987 PROJECTS

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
AUSTRALIA											
AUS-1	Prec. (R)	487 km Target 7100km Control	East of Melbourne	37°43'S lat. 146°15'E long	1987 June Oct. Yes	Water supply autho-rity	Air, acetone burner in-cloud near -6°	244 g/hour 3,66 kg	Cumulus + orographic clouds	16 Days	
AUSTRIA											
AU-1	Op.	500 Target	HTP-Lower Austria (Hail Test Project)	48°15'-48°30'N 15°20'-15°50'E	1981 Every year Yes	Agr. (P)	Air: 2 A/C seeding at cloud base with acetone burners	568 l acetone solution (8%) 10 l/hour/ generator	Convective clouds. Generally bases warmer than +10°C, summit temperature between 0 and -20°C not accurately known).	18 Days: May through August 1987	Historic records, Crop damage, Hail pads. EIS
AU-2	Op. Hail	1700 Target	HTP-Styria (Hail Test Project)	46 30°-47 15°N 15 30°-16 00°E Styria, districts of Weiz, Gleisdorf and Radkersburg	1982 Every year Yes	Agr. (P)	Air: 4 A/C seeding at cloud base with acetone burners.	4000 l acetone solution 14 l/hour/ generator	Convective clouds. Generally bases warmer than +10°C, Summit temperatures between 0 and -20°C. Subjective decisions regarding seeding. Project duration until 1992.	41 Days: May through Sept.	Historic records, Crop damage, Hail pads.
BULGARIA											
BG-1	R O Hail	14000km	BG-1	42°N-24°E 43°30'N-23°30'E	1969 Yes	A Wea Serv Ins Inst	Pyrotechnic Flare rockets	PbI_2 4310 kg	In cloud seeding -5°C - -10°C	26 Days May-Aug 1987	None
CHILE											
CH-1	PE E PR INC R	2000 km^2	Precipitation Enhancement	Copiapo-Ovalle	1979 Yes	Agr.		G/B Ag I	Convective clouds + orographic clouds Cloud base + 10°C Cloud tops -20°C	July-Aug 1987	
CHINA											
CN-1	R O	4000 Target	Hail Suppression	North Xinjiang	1978 Yes	Agr.	Artillery shells in cloud seeding	30 kg AgI 40 DBZ radar echo seeding criteria	Convective cumulus cloud base+10°C cloud tops colder -20°C	May - Aug 100 days	Cost/ benefit study made

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
CHINA	(continued)										
CN-2	Emer-gency O PE	--	Precipitation Enhancement To fight forest fire + hail suppression	Middle-East Helongiiang Province and Xingan Mtn area	1985 Yes	Fores-try Wea Serv	Aircraft + artillery shells. In-cloud seeding AC 0°C - -10°C shells - 4°C	100 kg AgI 500gr-1kg/km PbI using 1-2T	Convective cumulus + stratiform Cloud top temp. colder than -20°C	120 Days: May-Sept	Crop damage Evalua-tion Criteria
CN-3	O R	15000 km^2	Precipitation Enhancement Water supply	North Slope Tianshan Mtn Xinjiang	1978 Yes	Ag	Aircraft acetone burner. In-cloud seeding Seeding criteria -10°C - -16°C clouds containing supercooled water	Seeding rate 2,6 gr/min 10 kg/year	Stratiform clouds Cloud base +10°C Cloud tops warmer than -20°C	70 Days: Dec 1986 Jan+ Nov-Dec.	Cost/ benefit studies made Radar echo seeding criteria
CN-4	R	4600 km^2	Hail Suppression	Zhuolo county Hebei Province	1985 Yes	Ag Wea Serv	Explosive artillery shells in cloud seeding	14 kg/year	Convective cumulus Radar reflectivity seeding criteria	May - Oct	Crop damage Eval. criteria
CN-5	R O	9300km Target 3000km Control	Precipitation Enhancement Water supply	Linyang County Human Province	1983 Yes	Ag	Explosive in cloud seeding	50-150 gr/cloud Total 8.6 kg/year	Convective cumulus. Cloud base +10°C criteria for seeding 30 dbZ at 6 Km	July - August	Rando-mized Experi-ment Crop damage Histo-rical records evalua-tion planned
CN-6	O	1400	Hail Suppression	North Tianjin	1984 Yes	Ag	Explosive in cloud seeding $\leq$ 0°C	19 kg AgI	Convective cumulus Cloud base +10°C criteria - radar echo $\geq$ 30 dbZ, top $\geq$ 8 Km	40 Days: April - Oct.	Compari-son with histo-rical records & crop damage. No eval-uation planned
CN-7	PE Hail Op	7500	Precipitation Enhancement Hail Suppression	South Guizhou	1980 Yes	Ag	Artillery shells Rockets	19 Kg AgI/year	Cumulus seeding with bases +10°C or colder Cloud tops 0°C - -20°C Use radar echos as seeding criteria	March - August 1987	Crop damage& Historic records as eval-uation criteria

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
CHINA	(continued)										
CN-8	PE Water Supply Hail Op	--		Middle East Helongfiang Province & greater Kingan Mtns area	1967 Yes	Ag Fores-try	Artillery shells In-cloud seeding explosive shells <-5°C seeding criteria	25 kg/year 1 kg/km dry ice	Cumulus seeding using radar echo and top heights as seeding criteria	May - Aug 1987	Crop damage & Historic records as evaluation criteria
CN-9	Op.	2280	Precipitation Enhancement Hail Suppression	West of Hubei Province	1974 Yes	Ag	Explosive artillery shells in cloud seeding.	150 g AgI/cloud 1.6 Kg/year	Convective clouds and orographic	May - Aug 1987	Crop damage comparison with historic records
CN-10	PE Hail	5000	Precipitation Enhancement and Hail Suppression	East Qinghai	1973 Yes	Ag	Explosive artillery shells in cloud seeding	50 kg AgI/year	Cumulus seeding with bases colder than +10°C and tops colder than - 20°C and using radar echoes as seeding criteria	May - Oct 1987	Crop damage comparison with historic records
CN-11	PE Hail Forest fire supp O	1050 km^2	Precipitation Enhancement and Hail Suppression	Inner Mongolia	1959 Yes	Agr. Res. Foundation	Explosive artillery shells + solid dispersal from aircraft In cloud + cloud top seeding	60kg AgI/year IS-5 (AgI+Dry Ice) about 200gr/km	Cumulus + layer clouds Base temp +10°C or colder seeding criteria cloud depth + top temp.	120 days	
CN-12	PE. R O	1500 km^2 Target 1500 km^2 control	PE	Converge area of Gutian Reservoir Gutian County Fujian	1975 Yes	Hyd.	Explosive artillery shells. In cloud seeding	5 kg AgI/year	Cumulus + layer clouds bases colder than +10°C and cloud tops 0°C - -20°C. Seeding criteria Forecast radar echo + radiosonde data	Apr-June 1986 Sept-Oct 1987	Randomized exp. evaluation is with Hist. records& availabl to WMO Cost/ Benefit study.
CN-13	PE Water supply Augmentation Hail Supp O	33000 km^2	Precipitation Enhancement + Hail Suppression	Central Sichuan Province	1959 Yes	Agr.	Explosive artillery shells and rockets In cloud seeding	100 kg AgI/year	Cumulus + layer clouds with bases warmer than +10°C and cloud tops colder than 0°C but warmer than -20°C. Cloud depth must be > 1500m for rain making	Apr - Aug 1987	Comparison Historic records + target control comparisons

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
CHINA	(continued)										
CN-14	Hail Supp R O	Target 400 km^2 Control 600 km^2	Hail Suppression	Min county Ganshu Province	1986 Yes	Agr. Wea. Serv.	Explosive artillery shells for in cloud seeding at temp. < -5°C	10 kg AgI/year	Convective clouds treated with base temp colder than +10°C and tops colder than -20°C	June-Aug 1987	Comparison with Historical records & crop damage. Doc. available.
CN-15	PE water supply Hail Forest Fire reduc. R O	50000 km^2	PE Hail Suppression	Middle West Jilin Province	1958 Yes	Agr. Energy	Explosive artillery shells and aircraft(3) solid dispersal and acetone burners for in-cloud seeding at temp < -5°C	20 kg AgI/year + 100 gr dry ice used at 1kg/km Total 3tons/year	Convective clouds and layer clouds seeded. Thickness > 1.6km; cloud top temp. -5 to -20°C	Apr-Sept. 1987 100 days	Comparison with historical records aircraft observations. Doc. planned.
CN-16	PE R	1800 3300 km^2	PE	Hunan Province I area 111°25' 28°08' II area 113°35' 28°12' boundary of Linyang and Changsha	1979 Yes	Res. Foundation local government	2 to 3 guns, 37mm anti-aircraft, AgI shells seeding single cumulus clouds at about 3-4 km from earth's surface	40-200gr. AgI per cloud. 2 kg AgI/year	Convective clouds treated with cloud base temp. warmer than +10°C and cloud tops colder than -20°C. +30dbz reflective factor	July-Sept. 60 days	Clouds randomly selected evaluation. Rep planned E/S & cost/ benefit study made
COTE D'IVOIRE											
CI-1	PE INC R	10000 km^2 3x3000 target area 36000 km^2 control area	Inc	South Coast	1987 Yes	Univ.		1 liter/hour 100 kg of Ag I per season. Every day seeding with AgI from 10AM to 2PM with a solution of 8 gr/liter of Ag I	Convective clouds with cloud tops colder than 0°C but warmer than -20°C	Jan, Feb March, Apr, Dec.	EIS available Comparison stat records Pre. evaluation 1st year available WMO

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
FRANCE											
FR-1	Res. Ops. Hail	470000 Target	Hail Prevention National Association for the study and fight against Atmospheric Disturbances.	SW France, Departments 09, 11,16,17,31,33 40,64,65,66,81	1952 Every year Yes	Agr. (P) type 1901 inter-department mental asso-ciation	Ground: 462 acetone burning generators	8 g/hr/generator; 397 kg AgI total	Orographic clouds. Generally bases warmer than +10°C tops colder than -20°C. Criterian for operations: prediction of hail larger than 15 mm diameter.	4 to 22 Days depending in Dept: Apr - Oct	Historic records Crop damage EIS C/B
FR-2	Op. Fog	0.6 Target 0.6 Control	Turboclair for dissipation	Charles de Gaulle Airport runway 09/27 - OFU 09	1974 Every year Yes	Trans. (G)	Ground: 13 aircraft engines type ATAR 103 placed in housings along the border of the runway.				
GERMANY, FEDERAL REPUBLIC OF											
GE-1	Ops. Hail.	200 Target 400 Control	Hail Suppression Mühldorf/ Altötting	Bavaria Mühldorf Altötting	1983 Every year Yes	Agr. (local G.)	Air: 1A/C seeding at cloud base with AgI and using pyrotechnic flares	4 liters/hour 124 liters/year	Convectives clouds. Generally bases warmer than +10°C Op. decisions make use of information from Munich met. office-	13 days May-Sept 1987	No evalua-tion
GE-2	Ops. Hail	2400 Target 2800 Control	Weather Modification Project South Bavaria, Rosenheim-Miesbach	Country District Rosenheim-Miesbach FRG	1975 (air Yes	Agr. (G)	Ground and Air. Six ground based acetone burning generators and 2A/C seeding at cloud base and in-cloud (+8 to +3°C) using acetone burners	56kg AgI solution total burning at 10 l/hour or 8 kg/hour	Cumulus and orographic clouds. Generally bases warmer than +10°C and and tops colder than -20°C. Temp advection vertical windspeed, humidity, fronts altitude of troposphere radar echoes from weather radars are seeding criteria	1 May to 30 Sept. 22 Days	Historic records Crop damage C/B
HUNGARY											
HU-1	Ops. Hail	1200 Target	Hail Suppression Project of Baranya County	Southern Hungary 45°48' 46°03'N; 17°54'-18°37'E	1976 Every year Yes	Ins. Co (G)	Air: in cloud seeding at -3°C to -9°C using rockets	60-100 g/km^2 1009.4 kg total PbI_2 - seeding agent	Convective clouds. Generally bases warmer than + 10°C and tops colder than -20°C. Seeding criteria based on ht of 40 dbz 5 band radar reflectivity and tendency parameter of cell development	26 Days Apr-Oct	Historic records Crop damage Hail pads C/B

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
HUNGARY (continued)											
HU-2	Ops. Hail	1600 Target	Hail Suppression project of Bacs-Kiskum county	Southern Hungary 46°00'-46°27'N; 18°50'-19°25'E	1985 Every year Yes	Ins. Co.(G)	Air: in cloud seeding at -6 to -12°C using rockets	0.5 kg/rocket: 880 kg AgI total 723 kg - PbI_2 used, seeding agent	Convective clouds. Generally bases warmer than +10°C and tops colder than -20°C. Seeding criteria based on ht of 40 dbz 5 band radar reflectivity and tendency parameter of cell development	21 Days Apr-Sept	Historic records Crop damage Hail pads C/B
INDIA											
IN-1	PE Inc	2000 km^2		Gujarat State 21°-24°N 70°E-74°E	1987	A.	Aircraft. 100m-200m above cloud base	30000 kg NaCl 10 kg/day	Convective clouds + layer clouds criteria seeding liquid water content greater than 5 g/m^3 cloud depth > 2 km	38 Days: July-Aug	None
INDONESIA											
ID-1	Res. PE(E) Ext. Inc	400 Target 460 Control	Rain making (rain enhancement)	West Java	1985 Every year Yes	Agr. (G), Enr. (G), For. (G), Hyd. (G).	Air and Gnd: 6 ground based liquid spray generators, 5 A/C with spray generators. Seeding at ground, cloud base and in-cloud	3000 kg/day NaCl 60 tons for 21 days (by aircraft). 300 Kg/day urea solution (1 part urea, 3 parts water); 1000 kg for 30 days by ground generator. Positive results	Convective clouds Generally based warmer than +10°C. Tops warmer than 0°C. Seeding criteria: (a) surface tel. hum. greater than 65%, (b) average tel. hum. from surface (830 to 700 mb is equal or greater than 50%, (c) wind speed at 700 mb 8-12 knots	30 Days: June-July 15 Days: Oct.	Rando mized also historic records EIS
ISRAEL											
IS-1	PE (R) Inc. 0	2740 km^2 Control 1500 km^2		Lake Tiberias Catchment basis	1952 Yes	G A	3 aircraft 64 ground gen cloud base seeding aircraft	600 gr/hour 300 kg	Cloud base + 10°C Convective clouds Cloud top -20°C or colder.	Nov 85-May 86 Nov. 86-Dec. 86 60 days	Rando-mized Experi-ment analysis available

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
MALAYSIA											
MY-1	Ops. Dev. PE (E) (R)	1139 Target	MADA Cloud Seeding	Kedah, Malaysia (6°N, 101°E)	1977 Every year Yes	Agr. (G) & Wea Ser. (G)	Air: 2A/C using liquid spray and solid dispersing units. In-cloud seeding at 11 to 15°C (6000 - 8000 ft).	50-100 kg/min (solid); 40-80 l/min (liquid) 50-100 kg/min NaCl in 40-80 lit/min liquid 134,500 kg/year 50-100 kg/min solid urea, 40-80 lit/min liquid=76,530 kg/year	Convective clouds. Generally base warmer than + 10°C, tops variable from 0°C to -20°C	155 Days. May-June Oct-Dec	Historic records
MEXICO											
ME-1	PE Inc PR O	10000 km^2	Intensification of precipitation	Estado De Michoacan (Morelia)	1987	Enr	Aircraft seeding	1775 liters Ag I	In cloud seeding with cloud base temp +10°C or colder	Sept. 14 days	
ME-2	PE Inc PR O	10000 km^2		Ensenada Baja		G	Aircraft seeding	750 liters Ag I	Cumulus and layer clouds	March 12 days	
ME-3	PE	50000 km^2		Valle De Toluca	1982 Yes	G	Aircraft seeding	1347 liters	Cumulus, orographic and layer clouds	June-Oct 21 days	
MOROCCO											
MA-1	Res Ops. PE (E) (R) augm ent snow pack.	15000 Target	Al-Ghait	High and Central Atlas Mountains	1984 Every year yes	Wea. Ser. (G)	Air and ground using acetone burners. In-cloud seeding between -5°C and 18°C using 3 A/C and 7 ground-based generators.	20 g/hr AgI 53 kg AgI, 40 hours/year 2% AgI acetone solution 15 kg NA I	Convective and orographic clouds. Generally bases colder than + 10°C and tops between 0 and -20°C.	Nov. 86 - 30 Ap. 88	Historic records analyses available. Note dates.
NORWAY											
NO-1	Ops. Fog	5-10 Target		Oslo Airport, Fornebu and Oslo Airport Gardermoen	1964 Every year Yes	Trans (G)	Air: 1 A/C seeding at cloud top and in-cloud (-1°C) using solid dispensing units	100 to 150 kg solid CO_2 per seeding CO_2	Layer clouds. Generally cloud bases between -3°C and -10°C with tops between 0°C and -20°C. Operations depend mainly on temp.	Jan-Mar Nov-Dec	C/B

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
PERU											
PE-1	Fog Disp-ersion Res.	28000 hect.	Fog Modification	18°12'S 76°75'W	1982 Yes	Met. Ser. Hyd. Ener.	Special collector			7 months	
UNITED ARAB EMIRATES											
UAE-1	PE PR Inc	200 km^2	UAE GHQ Rain Enhancement Project	24°26'N 54°27'E	Jan 1987 Yes	GHQ Armed Forces	Aircraft (1) Pyrotechnic flaves	31,5 kg Ag I used at variable rate 1 gm/m^3 supercooled water 300 ft/min updrafts	In cloud -10°C in up-drafts Warm cloud seeding in future plans with area ammonium nitrate + water	Jan-Feb March-Apr June-July Aug-Nov Dec 29 days	
UNION OF SOVIET SOCIALIST REPUBLICS											
SU-1	Op. Hail	8600 Target	Hail Suppression	Uzbek SSR	1967 Every year Yes	Agr. (G), Wea-Serv. (G).	Air: in cloud seeding between -6 and -8°C using rockets and artillery shells carrying explosive and/or pyrotechnic flare generators.	AgI	Convective clouds, predominant cloud base temp. generally warmer than +10°C. Tops generally colder than -20°C. Operational alert based on probability of hail 0.4; seeding criteria based on radar reflectivity at 3.2 cm being less than that at 10 cm wave length.	63 Days: Apr-Sept	Historic records Crop damage. EIS C/B
SU-2	Op. Hail	7000 Target	Hail Suppression	Tajik SSR	1964 Every year Yes	Agr. (G), Wea-Serv. (G).	Air: in-cloud seeding between -6 and -10°C using rockets and artillery shells carrying explosive and/or pyrotechnic flare generators.	AgI	Convective clouds, predominant cloud base temp. generally warmer than +10°C. Tops generally colder than -20°C. Operations alert based on forecast hail probability 0.4; seeding criteria based on radar reflectivity at 3.2 cm being less than that at 10 cm wave length.	48 Days: Apr-Aug	Historic records, Crop damage, EIS, C/B

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNION OF SOVIET SOCIALIST REPUBLICS (Contd.)											
SU-3	Res. and Op. Fog	3500 500 100 m Target volume	Artificial Dissipation of Supercooled fog	Airport at Kishinev, Moldavia.	1985 Every year Yes	Res. (G). Wea. Serv. (G)	G/B: liquid propane spray	Propane	Seeding criteria based on temp. conditions, wind speed & presence of supercooled liquid water.	23 Days: Jan-March	Yes/ Physical evaluation based on observations of visibility in the target & surrounding area EIS, C/B
SU-4	Op. PE(R)	5000 Target 10000 Control	Seeding of Clouds to Enhance Winter Precipitation	Dnepropetrovsky Region Ukranian SSR	1985 Every year Yes	Agr. (G). Wea. Serv. (G).	Air: seeding in-cloud at temperatures less than -4°C in presence of liquid water using 4 A/C and solid dispensing units.	Dry ice (solid CO_2)	Frontal, layer clouds with cloud base temp. generally colder than +10°C. Tops generally warmer than -20°C. Criteria for seeding includes cloud thickness greater than 500 m.	30 Days: Jan-March Nov-Dec	Comparison of precipitation in target & control for 12-hr periods EIS, C/B
SU-5	Res. Op. PE(R)	1000 Target 1000 Control	Seeding of Clouds to Enhance Precipitation	Uzbek SSR, Kashkadarinskaya Region	1985 Every year Yes	Agr. (G). Wea. Serv. (G).	Air: seeding in-cloud between -4 and -18°C using rockets and 1 A/C carrying pyrotechnic flare generators and solid dispensing units.	AgI and Dry ice (solid CO_2)	Layer and orographic clouds, cloud base temp generally colder than +10°C. Tops warmer than -20°C. Seeding criteria cloud base temp. -4 to -20°C, cloud thickness 300 m, base 1000 m, changes in absolute moisture saturation, speed of cloud glaciation.	16 Days: Nov-Dec 86 Jan-Apr 87	Instrumental evaluation EIS, C/B
SU-6	Res. Op. PE(R)	3800 Target	Precipitation Enhancement	Georgian SSR	1985 Every year Yes	Agr. (G). Wea. Serv. (G).	Air: pyrotechnic flares carried by rockets seeding in-cloud at temp. between -4 and -18°C.	AgI	Convective clouds, cloud base temp. generally colder than +10°C. Tops warmer than -20°C. Seeding criteria requires clouds thicker than 2 km.	30 Days: May-Sept	Yes Yes (H) Hydrological evaluation EIS, C/B

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNION OF SOVIET SOCIALIST REPUBLICS (Contd.)											
SU-7	Op. Hail	12350 Target	Hail Suppression	Georgian SSR	1964 Every year Yes	Agr. (G), Wea. Serv. (G)	Air: explosive and pyrotechnic flare generators carried by rockets & artillery shells. Seeding at cloud base and in-cloud at temp. between -3 and -9°C	AgI	Convective clouds, cloud base temp. generally warmer than +10°C. Tops colder than -20°C. Seeding criteria based on forecast probability of hail greater than 0.4 & ratio of radar reflectivity at 3.2 cm to that at 10 cm wave length being <1.	69 Days: Apr-Oct	Historic records, Crop damage, EIS, C/B
SU-8	Op. Hail	23200 Target	Hail Suppression	Moldavian SSR	1964 Every year Yes	Agr. (G), Wea. Serv. (G)	Air: seeding in-cloud between -6 and -15°C and at cloud base using rockets carrying pyrotechnic flare and explosive generators	AgI	Convective clouds, predominant cloud base temp. generally colder than +10°C. Tops colder than - 20°C. Operations alert based on forecast of 0.4 or greater probability of hail; seeding criteria based on ratio of radar reflectivity at 3.2 cm to that at 10 cm wave length being <1.	46 Days: May-Sept	Historic records, Crop damage, EIS, C/B
SU-9	Op. Hail	3050 Target	Hail Suppression	Ukranian SSR Odessa Region	1980 Every year Yes	Agr. (G), Wea. Serv. (G)	Air: seeding in-cloud between -6 and -10°C and at cloud base using rockets carrying pyrotechnic flare generators	AgI	Convective clouds, cloud base temp. generally warmer than +10°C. Tops colder than -20°C. Operations alert based on forecast of 0.4 or greater probability of hail; seeding criteria based on ratio of radar reflectivity at 3.3 cm to that at 10 cm wave length being <1.	14 Days: May-Sept	Historic records, Crop damage, EIS, C/B
SU-10	Op. Hail	11300 Target	Hail Suppression	Armenian SSR	1964 Every year Yes	Agr. (G), Wea. Serv. (G)	Air: seeding in-cloud between -6 and -8°C and at cloud base using rockets and artillery shells carrying pyrotechnic flare and explosive generators	AgI	Convective clouds, cloud base temp generally colder than +10°C. Tops colder than -20°C. Operations alert based on forecast of 0.4 or greater probability of hail; seeding criteria based on ratio of radar reflectivity at 3.2 cm to that at 10 cm wave length being <1.	59 Days: Apr-Oct	Historic records, Crop damage, EIS, C/B

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNION OF SOVIET SOCIALIST REPUBLICS (Contd.)											
SU-11	Op. Hail	4950 Target	Hail Suppression	Ukranian SSR, Crimea Region	1968 Every Year Yes	Agr. (G), Wea. Serv. (G)	Air: seeding in-cloud at -6 and at cloud base using rockets carrying pyrotechnic flare generators	AgI	Convective clouds, cloud base temp generally warmer than +10°C. Tops colder than -20°C. Operations alert based on forecast of 0.4 or greater probability of hail; seeding criteria based on ratio of radar reflectivity at 3.2 cm to that at 10 cm wave length being <1.	23 Days: May-Sept	Historic records, Crop damage, EIS, C/B
SU-12	Op. Hail	7700 Target	Hail Suppression	Krasnodar Region	1967 Every year Yes	Agr. (G), Wea. Serv. (G)	Air: seeding in-cloud at -6 and at cloud base using rockets and artillery shells carrying pyrotechnic flare and explosive generators	AgI	Convective clouds, cloud base temp. generally warmer than +10°C. Tops colder than -20°C. Operations alert based on forecast of 0.4 or greater probability of hail; seeding criteria based on ratio of radar reflectivity at 3.2 cm to that at 10 cm wave length being <1.	41 Days: May-Oct.	Historic records, Crop damage, EIS, C/B
SU-13	Op. Hail	13300 Target	Hail Suppression	Azerbaijan SSR	1967 Every Year Yes	Agr. (G), Wea. Serv. (G)	Air: seeding in-cloud between -3 and -12°C and at cloud base using rockets and artillery shells carrying pyrotechnic flare and explosive generators	AgI	Convective clouds, cloud base temp.generally colder than +10°C. Tops colder than -20°C. Operations alert based on forecast of 0.4 or greater probability of hail; seeding criteria based on ratio of radar reflectivity at 3.2 cm to that at 10 cm wave length being <1.	45 Days: Apr-Oct	Historic records, Crop damage, EIS, C/B
SU-14	Op. Hail	10100 Target	Hail Suppression	Northern Caucasus	1967 Yes	Agr. (G), Wea. Serv. (G)	Air: seeding in-cloud between -3 and -15°C and at cloud base using rockets and artillery shells carrying pyrotechnic flare explosive generators	AgI	Convective clouds, cloud base temp. generally warmer than +10°C. Tops colder than -20°C. Operations alert based on forecast of 0.4 or greater probability of hail & seeding criteria based on ratio of radar reflectivity at 3.2 cm to that at 10 cm wave length being <1.	49 Days: May-Oct.	Historic records, Crop damage, EIS, C/B

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNION OF SOVIET SOCIALIST REPUBLICS (Contd.)											
SU-15	Res. Op. PE	3000 Target	Precipitation Enhancement	Modavian SSR	1985 Every year Yes	Agr. (G), Wea. Serv. (G)	Air: 1 airplane plus rockets carrying pyrotechnic flare generators. In-cloud seeding -4 to -18°C	AgI	Convective and layer clouds, cloud base temp. generally colder than -10°C. Tops generally between 0 and -20°C. Seeding criteria cloud thickness and water content.	60 Days Nov-Dec 86 Jan-March 1987 May-Sept. 1987	Randomized Experiment Instrument and hydrological evaluation Eval. EIS, C/B
UNITED STATES OF AMERICA											
US-1	PE Op	4160 Target 7800 Control	Kings River Project	Sierra Mtns Central Cal	1973 Yes	Hyd.	GB + air 15 GB 1 A/C Cloud tope seeding 1 A/C	8.7 kg/Ag I	Orographic clouds	8 Days Dec.	
US-2	PE R O	1350 Target 988 Control	KDWDC	Kaweah River KDWDC California	1976 Yes	Hyd., (P)	G/B and Air: 5 G/B generators, cloud top seeding by 1 A/C, acetone burning generators and pyrotechnic flares	2-20 g/min/pyrotechnic generator 10-20 g/hr/acetone units, 8.6 kg Ag I Total per season	Orographic clouds	37 Days: Jan-Apr Oct-Dec	
US-3	Op. PE	-	Tahoe-Truckee Project	Lake Tahoe - Truckee River Watershed, Nevada and California	1977 Yes	Hyd. (G-State)	G/B: 6 acetone, isopropylamine and kerosene burning generators	42 g/hr/generator (isopropylamine), 22 g/hr/generator (acetone), 23.2 kg AgI/season, 350 lbs dry ice	Orographic clouds	38 Days: Jan, Feb, Nov, Dec	
US-4	Ops. PE(R)	13000 Target	Walker River Project	Walker River Watershed, California and Nevada	1977 Yes	Hyd. (G-State)	2 A/C seeding at cloud top using acetone burning and pyrotechnic flare	2 g/min/pyrotechnic flare, 0.5 to 3.0 gal/hr (27 AgI/acetone), 10.1 kg AgI/season	Orographic clouds	56 Days: Jan, Apr, Nov-Dec	
US-5	Op. PE	614 Target 2600 Control	Upper American River Project	Sacramento, California	1979 NR Yes	Hyd., Energy (G-Muni.)	G/B: 8 acetone burning generators	20 g/hr/generator, 18.4 kg AgI total	Orographic clouds	28 Days: Jan, Feb, March, Nov Dec	
US-6	Op. PE(R)	1196 Target	Ruby Mountains Project	Nevada	1981 NR Yes	Res. (G-State)	G/B: 6 G/B aerosol generators	50 g/hr, 5.0 kg AgI total	Orographic clouds	43 Days: Jan, Feb, March, Nov Dec.	

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNITED STATES OF AMERICA											
US-7	Op. PE(R)	3120 Target 15600 Control	87-608 Kern River Project	Kern River Watershed, California Southern High Sierras	1982 NR Yes	Hyd. (P)	Air: 1 A/C using pyrotechnic flares seeding AgI at cloud top and in-cloud	60 to 30,000 g/hr, 14 kg AgI total	Orographic clouds	35 Days: Jan-May Nov, Dec	
US-8	Op. PE(R)	2600 Target	86-507 T-18	Texas portion of the water- shed of the Red Bluff Lake	1983 NR Yes	Energy and Hyd.	G/B: 13 arc-type AgI generators	0.5 to 2.0 g AgI/ hr/generator, 4.6 kg/year	Convective clouds & synoptic scale disturbances.	145 Days:	
US-9	Op. PE	9100 Target	Santa Barbara County California	Santa Barbara County, California	1982 Yes	PE Hyd	10 G/B. 1 A/C seeding in-cloud	5 g/min, 2.8 kg AgI total	Bands organized on mesoscale.	7 Days: Nov-Dec	
US-10	Res	3484 Target	Stark County North Dakota	Stark County	-- Yes	Res.	1 aircraft	4 kg total	Convective clouds. Technology develop exploratory field testing	7 Days June-July	
US-11	Ops. PE(R)	9100 km^2	Colorado River Muni Water Dist	Big Springs Texas	1975 Yes	Muni	1 Aircraft. Pyrotechnic flares. Cloud bases seeding	2.1-7.1 g/min 2,3 kg cons/year	Convective and layer clouds seeded	15 Days Operational Apr-July	
US-12	Op. PE	218 km^2	Hitch Ranch Texas County Oklahoma	Hitch Ranch Texas County Oklahoma	1977 Yes	Ag.	10 GB generators arctype	5 to 2 gr/hour 2.9 kg total	Convective and layer clouds	101 Days: Apr-Sept	
US-13	PE OP	31200 km^2	Western Kansas Weather Mod.	West Central South West Kansas	1975 Yes	Hyd.	4 aircraft acetone burners and dry ice dispenser	Ag I generators 126 l/min 68.1 kg/season	Convective clouds	62 Days: March- Sept.	
US-14	O	$26km^2$	85-545	Medford, Oregon	1972 Yes	Trans Fog	1 aircraft cloud top seeding. Dry ice	1425 lbs	Supercooled layer clouds	4 times Nov-Dec	No docs
US-15	PE	11700 Target	City of San Angelo	San Angelo, Texas	1985 Yes	Hyd.	1 aircraft. Acetone burners + pyrotechnic	150-225 g/hr/ generator (acetone) 2 g/s/generator (pyrotechnic), 19.7 kg used	Convective clouds	51 Days: Apr-Sept	

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNITED STATES OF AMERICA (Continued)											
US-16	PE Hail	9178 km^2	87-602 North Dakota Weather Modification Project District I	West Central North Dakota	1977 Yes	Ag.	Aircraft cloud base seeding and in cloud pyrotechnic flare potential and dry ice seeding capacity. In cloud seeding carried out at -2°C to -12.5°C.	25.3 kg AgI and 596 lbs of dry ice used	Cumulus clouds. Cloud base height, cloud base diam. temp. & liquid water content determine seeding criteria	23 Days: June-Aug	
US-17	Op. Hail and PE	17711 km^2	87-603 North Dakota Weather Modification Project District II	Northwestern North Dakota	1977 Yes	Agr.	Aircraft with acetone burner, pyrotechnic + solid dispersal capability. In-cloud seeding criteria are -2°C to -12.5°C.	49.4 kg AgI used; 640 lb dry ice	Convective clouds are the targets. Consumption rate is variable depending on cloud base height. Cloud base diam. temp. liquid water content	29 Days: June-Aug	
US 18	Op. PE	3120 Target 835 control	Big Greek Proj 86-589 87-619	Upper San Joaquim river Southern High Sierras Cal.	1972 Yes	Hyd. Ener	Aircraft and ground AgI burners, Pyro-technic flares on aircraft for in cloud seeding	25.4 kg Ag I consumed	Winter storm clouds	Jan-Dec 100 days operating	No Analysis
US 19	Op. PE	6240 km^2	Utah Snow Park augmentation Project (87-613)	Mtn Watersheds in Utah	1974 Yes	Agr. Hydro	20 ground Ag I generators are used	6 gr/hour Ag I total consumption 7.2 kg	Largely orographic clouds containing mesoscale scale rain-bands	10 Days: Nov-Dec	Analysis availabl
US 20	Op. PE	650 km^2	Mokelume	Central Sierra Nevada Mtns, Cal.	1974 Yes	Hyd. Ag Ener	5 ground based Ag I generators	25 gr/hour, 27.7 kg Total consumption	Mesoscale rainbands imbedded in orographic rainbands with cloud top temp. near -10°C	Seeding operation 40 days Jan-Feb Nov-March Dec-April	Yes will be availabl to WMO
US 21	Op. PE	1300 km^2	Lake Alamor 87-611	North Sierra Nevada California	1972 Yes	Agr. Hydro Energy	5 ground Ag I generators	25 g AgI/hour Total consumption 23 kg/year	Orographic clouds,	46 Days: Jan, May, Nov, Dec	Ramdom-ized Exp. Plan-ning doc availabl
US 22	FOG	52 km^2	Ground based Cold fog dissip. system 87-598	Elmendorf AFB Alaska	1971 Yes	Defen se	24 liquid propane tanks, ground dispensing	Total consumption 554 gallons at 12 gal/hour	for runway clearance of supercooled ground fog	Months operating Jan-Dec 3 days/yr	C/B analysis availabl

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNITED STATES OF AMERICA (Continued)											
US 23	Fog	130 km^2	Ground-based Cold Fog Dispersal System 87-599	Fairchild AFB, Washington	1971 Yes	Def.	23 liquid propane tanks	10 gal/hr, total consumption 4608 gal	for runway clearance of supercooled fog	21 Days: Jan-Feb Nov, Dec	
US 24	Ops. PE	260 km^2	85-566 Sun Valley	Sun Valley, Idaho	1980 Yes	Rec.	1 aircraft: 1-2 ground based Ag I generators Pyrotechnic flares	Seeding rate 100-300 gr/hour consumption 12.5 kg	Orographic clouds, cloud base temp. <0°C.	27 Days: Jan-Feb Nov-Dec	
US 25	Ops. PE	260 km^2 2072 Control	87-615 Central Colorado Project	Vail and Beaver Creek, Colorado	1978 Yes	Recr	8 ground-based Ag I generators	Seeding rate. 5.40 g/hr, 10.7 kg/year Total consumption	Mesoscale rain in orographic clouds	39 Days: Jan-April Nov-Dec	
YUGOSLAVIA											
YU-1	Hail	11500 km^2	Hail Suppression activity	E Slovenia N Croatia NE part of Bosnia, Central Serbia	1967 Yes	Ag + Wea. Serv.	Rockets and Devises	In cloud treatment with rockets + pyrotechnic flaves	Seeding criteria layer between -5°C and +5°C	15 Apr-15 Oct 48 days	Evaluation Document planned
YU-2	Hail	62797 km^2	Hail Suppression	Serbia	21 years	G	1346 rocket launching stations for seeding at 4-6-km alt.	Ag I 2-3 gr/sec 15 min seeding period		15 Apr-15 Oct	
ZIMBABWE											
ZM-1	O PE(R) Water Sypply	390500 Target	National Cloud Seeding Operation	Zimbabwe	1972 Yes	Wea. Ser.	Air: 2 A/C seeding with pyrothnic flares	1505 Cartridges TB 2 consumed (AgI) (AgI) To seed 1106 clouds	Cloud top seeding. at -10°C or colder ± 21000 AMSL Cloud base temp estim 20°C.	46 Days Nov 86 Apr. 87	Randomized exp eval. doc. availble

V-ADDRESSES OF REPORTING AGENCIES

AUSTRALIA	CSIRO Division of Atmospheric Research MORDIALLOC, Victoria 3195
AUSTRIA	Zafmug Zentralanstalt für Meteorologie und Geodynamik Hohe Warte 38 A-1190 VIENNA
BULGARIA	Hydrometeorological Service Weather Modification Laboratory 66 Lenin Blvd 1184 SOFIA
CHILE	Servicio Agricola y Ganadero Telecomunicaciones del agro Avda - Bulnes 140 SANTIAGO
CHINA	State Meteorological Administration 46, Baishiqiaolu Western suburb, BEIJING, 100081
COTE D'IVOIRE	PALMINDUSTRIE ABIDJAN
FRANCE	ANELFA 52 rue Alfred Duméril 31400 TOULOUSE
GERMANY, FEDERAL REPUBLIC OF	Deutscher Wetterdienst - Zentralamt Frankfurter Str. 135 6050 OFFENBACH AM MAIN
HUNGARY	Meteorological Service of the Hungarian People's Republic P.O. Box 38 H-1525 BUDAPEST
INDIA	Indian Institute of Tropical Meteorology PUNE - 411005
INDONESIA	Unit Pelaksana Teknis Hujan Buatan Badan Pengkajian Dan Penerapan Teknologi Jln M.H. Thamrin No. 8 JAKARTA PUSAT

ISRAEL	Israel Meteorological Service P.O. Box 25 BET DAGAN
MALAYSIA	Malaysian Meteorological Service Jalan-Sultan 46667 Petaling Jaya SELANGOR
MEXICO	Direccion General de Est-INF Secretariat de Agricultura y Recursos Hidraulicos Av. Observatorio No. 192 C.P. 11860 MEXICO D.F.
MOROCCO	Direction de la Météorologie Nationale Programme Al-Ghait Division du Développement et de la Recherche B.P. 8106 CASA/OASIS CASABLANCA 02
NORWAY	Norwegian Meteorological Institute P.O. Box 43 Blindern 0313 OSLO 3
PERU	SENAMHI Centro de Investigacion y Desarrollo Av. Republica de Chile 295 Oficina 206 LIMA
UNITED ARAB EMIRATES	United Arab Emirates GHQ Armed Forces Committee on Rain Enhancement P.O. Box 2501 ABU DHABI
USSR	USSR State Committee for Hydrometeorology and Control of Natural Environment 12, Pavlik Morozov Street 123376 MOSCOW
USA	National Oceanic and Atmospheric Administration 6010 Executive Blvd. ROCKVILLE, MD 20852
YUGOSLAVIA	Federal Hydrometeorological Institute Bircaninova 6 P.O.B. 604 11000 BEOGRAD
ZIMBABWE	Dept. of Meteorology Services Box BE 150 Belvedere HARARE

VI – REGISTER OF NATIONAL WEATHER MODIFICATION PROJECTS

List of Members reporting NO weather modification projects in 1987

ARGENTINA
BAHAMAS
BAHRAIN
BARBADOS
BELGIUM
BOTSWANA
BRAZIL
BRUNEI
CAMEROON
CANADA
CAPE VERDE
CHAD
COLOMBIA
CONGO
CYPRUS
CZECHOSLOVAKIA
DOMINICA
ECUADOR
FIJI
FINLAND
GERMAN DEMOCRATIC REPUBLIC
GHANA
GUINEA-BISSAU
GUYANA
HONDURAS
ICELAND
IRAN, ISLAMIC REPUBLIC OF
IRAQ
JAPAN
KUWAIT
LAO PEOPLE'S DEMOCRATIC REPUBLIC
LEBANON
LUXEMBOURG
MALAWI
MALTA
MOZAMBIQUE
NEPAL
THE NETHERLANDS
NEW ZEALAND
NEW CALEDONIA
NIGER
NIGERIA
PAKISTAN
PAPUA NEW GUINEA
POLAND
POLYNESIE FRANCAISE
PORTUGAL
STATE OF QATAR
REPUBLIC OF KOREA
RWANDA
SENEGAL
SEYCHELLES
SIERRA LEONE
SINGAPORE
SUDAN
SWITZERLAND
SYRIAN ARAB REPUBLIC
TANZANIA
TRINIDAD AND TOBAGO
UNITED KINGDOM
URUGUAY
ZAMBIA

VII-LIST OF COUNTRIES REPORTING 1988 PROJECTS

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ARGENTINA											
AR-1	Hail Supp Res. Op.	North 4500 km^2 South 1800 km^2	Hail Protection (Hail Suppression	N zone: 33°05'S-68°25'W S zone: 34°37S-68°10'W Provincia de Mendoza - Rep. of Argentina	1985 Yes	Minister of economies.	Rockets for in cloud seeding at -6°C.	18 gr/rocket total consumption 254 kg AgI and 270 gr IK/rocket total consumption 3804 kg	Convective and orographic clouds; in cloud seeding at -6°C with cloud base temp. colder than +10°C and cloud top temp warmer than -20°C. Desirable radar reflectivities should be between 1.10^{-9} + $5X10^{-9}$.	Oct-Nov Dec 87 Jan-March Oct-Nov Dec 88 N zone 50 Days S zone 48 Days	
AUSTRALIA											
AU-1	Prec. Enhan. Res.	Target 487 km^2 7100 Control	Thompson Catchment Melbourne Board	Lat. 37°43'S Long. 146°15'E	1987 Yes	Water Supply Authority	1 Aircraft with AgI burner	4.58 g/hour 6.08 kg	In cloud seeding near -15°C convective and orographic clouds	May-Oct 11 Days	Randomized Exp. evaluation availble
AU-2	PE O	5770 km^2	HCC Op. Cloud seeding	Central Plateau Tasmania	1988 Yes	Ener.	One aircraft with acetone AgI burner	600 gr/hour Total consumption 38.76 kg Ag I	Convective + stratified clouds for in cloud seeding temp. colder than -5°C and water content greater than 0.1 gr m^{-3} and cloud top temp. warmer than -20°C are desirable	July-Nov 1988 37 Days	Evaluation system compares with past randomized exp
AUSTRIA											
AUS-1	Hail Supp	500 km^2	HTP Lower Austria	48°15-48°30N 15°20-15°50E Krems Langenlois	1981 Yes	Agri. Priv.	2 Aircraft + pyrotechnic flares and Ag I acetone burners	10 l/hour 44.8 kg Ag I 700 l	Cloud base seeding of convective clouds	May-Sept 35 Days	C/D Hail Pads Hist. records Project until 1990.
AUS-2	Hail Supp. O	1700 km^2	Styria HTP	District WEIZ 46°30'-47°15'N 15°30'-16°00'	1982 Yes	Priv. Union	4 Aircraft with AgI acetone burners and pyrotechnic flares	14 l/hour seeding rate and total consumption is 3900 l, i.e., 187 kg Ag I	Convective clouds generally cloud base seeding with temp warmer than +10°C and cloud tops colder than -20°C.	May-Sept 38 Days	Project Duration 1995

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
BRAZIL											
BR-1	Prec. Augm. Intensification Red. O.	14000 km^2	Nucleacao Artificial do Tempo	37°W-4°S 41°-3°S 40°30'W 7°30'S-38°30'W	1974 Yes	Agr. Hyd.	3 Aircraft with dispensors of salt solution	93800 kg Nacl total consumption	Convective cumulus clouds with base temp near 10°C	Jan-May 105 Days	
BR-2	Prec. Augm.	semi-area NE Br. 400 target 400 control	Modart/ Petrolina Pernambuco IAE	Pernambuco	1987 Yes 2nd year of 5 year prog.	Scientific Inst.	Aircraft with dispensor for salt (NaCl)	300 kg of NaCl dissolved in 900 liters of water		Nov-June	Tech. pub. availble
BULGARIA											
BU-1	H R O	14200 Km^2	Bulgaria	42°N 24°E 43°N 30'E 23°30'E	1969 Yes Yes	Agr. Wea. Serv.	Rockets with pyrotechnic flares	Total consumption 15600 kgr.	Seeding convective clouds with PbI_2 in cloud treatment with temperature between -5°C - -10°C and with cloud base temp. warmer than + 10°C and cloud top temp. colder than -20°C	May to Aug. 36 Days	Evaluation based on hist. records made but not availble for distribution C/B
CHILE											
CH-1	PE Drought Redistribution water supply for Santiago R O	2000 km^2	Precipitation Enhancement Project	Region Matropolitana (Paralelo 335)	78/79 No	Ag. Pollution	1 Aircraft + Ag I pyrotechnic flares and CO_2	40 flares of Ag I of 0.80 kg and 35 kg of Dry Ice (CO_2) per trial	Seeding cumulus clouds in base and in cloud	75 Days	Radar Obser- of cloud develop availble
CH-2	PE	30000 km^2	Precipitation Enhancement by Servicio Agricola y Ganadero	Minister of Agriculture	11 years duration	Ag	1 Aircraft with dispensors for solution of salt and urea in water and a Ag I dispenser	Not provided	Controlled by radar reflectivity		

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
CHINA											
CN-1	Op. PE DR. Hail Supp	66200 km^2	Precipitation Office of Hubei Province	Hubei Province	1958 Yes	Gover- nement	4 aircraft artillery shells. Ground generators (explosive) + solid dispersal	Total dispersal 33 kg - Ag I 20 000 kg - CO_2 60 000 kg - NaCl	Cloud base $\leq$ 1 km Cloud depth $>$ 5 km Radar intensity $>$25 DB	Apr-Sept. Hail Supp July-Aug Precip. Enhan.	Studies on evaluation & result availble
CN-2	R O	Target 150000 km^2 Control 200000 km^2	Precipitation Office of Helongjiang Province	Helongjiang Province 43°20'-53°20N 121°30'-134°30E	1985	Gover-	Aircraft + artillery shells	Dry ice (CO_2) 500-1000 gr/km & 1000-2000 kgr Total consumption of dry ice/year 35 kg - Ag I Total cons/year	Aircraft used between 0° - 10°C. Artillery shells above 0°C	50-138 Days May-June Aircraft May-Sept Artillery shells	Studies on evaluation & result availble
CN-3	Hail Supp O	1100 km^2	Tianjin Hail Supp. Wea. Mod. Office Tianjin	116°4'25'' to 118°3'31''E 38°33'57'' 40°14'5''N	1974 Yes	Agr.	Rockets artillery shells	2 kg/AgI per operational day 8.5 kg Ag I Total cons/year	Explode shells above 0°C level select days with radar echo intensity $\geq$ 30 db echo top height $\geq$8km	April-Oct 41 Days	Evaluation is a function of Crop Damage
CN-4	PE Hail Drought R O	1500 km^2 Control 1500 km^2	Seeding of stratiform clouds + Precipitation enhancement scheme	Middle flat area of Shanxi 107°25'-110°E; 34°10'-35°10'N	1982 Yes	Wea. Serv.	1 aircraft rockets artillery shells solid dispersal (explosive ground generators	1 gr. Ag I/km 40 kg/year 2000-3000 gr/km of CO_2 and 2000 kgr/year 5000-10000 g/km of NaCl and 8000 kg/year	Seeding criteria for cloud top + in cloud seeding cold clouds 0 - -10°C; warm clouds 0 - 22°C. LWC $\geq$0.2/m^3 Cloud base $<$ 2500 m Cloud depth $\geq$3000m For stratiform clouds Cloud depth $\geq$3000 m Cloud base $<$2500 m For cumulus clouds a cloud top height $>$ 7000 m and radar intensity $>$ 40 db are desirable seeding criteria	40 Days Apr- May Aug-Sept Prec. Mod 100 Days May-Sept Hail Supp	Evaluation reports availble
CN-5	R O PE Drought Hail	34760 km^2	Ningxia	Precip. mod. 35°10'-38°10'N 104°-107°41' E Hail Supp. 35°10'-37°00' N 105°10'-107°0 E	1974 Yes	Wea Serv. Agr. Res.	1 aircraft. Artillery shells	No consumption rate provided for given experiments. 20 kg Ag I consumed during year. 100 kg/day of CO_2 used per seeding day 1500 kg CO_2 consumed during the year.	Temperature and liquid water content determine seeding criteria	70 Days Prec. mod 150 Days Hail Supp	Evaluation Doc availble

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
CHINA (continued)											
CN-6	PE Drough Hail	Target 15000 km^2 Control 20000 km^2	Jilin Province	43 - 47°N 121°- 126°E	1986 Yes	Jilin Prov. Govt.	2 aircraft. Artillery shells Ag I acetone burner. Liquid spray equipment	Ag I 0.3 - 1 gr/km. CO_2 100-1000gr/km	In cloud seeding criteria. Cloud top temp. T > -20°C. Cloud depth > 1.6.km Cloud base height < 2km Seeding level temp. Ts -5°C ~ -20°C For cumulus seeding criteria T top > -20°C H base < 1000m Cloud top height >6000m	Apr-Sept	Reports availble
CUBA											
CU-1	PE R Extend Preci- pitation period	150000 km^2	Meteorological Scientific experiments near Camagüey	Province of Camagüey	1982 Yes	Met. Serv.	2 aircraft pyrotechnics	1000 pyrotechnics containing 3 kg Ag I. Total annual consumption 30 kg	In cloud seeding approximately near 5.7-6 km, - 10°C	July-Sept. 40 Days	Reports availble
FRANCE											
FR-1	Hail Supp R	Target 55000 km^2 Control 47000 km^2	Hail Supp (ANELFA)	SW France Dept. 9, 11, 16 17, 31, 33, 40 64, 65, 66, 81	1952 Yes	Agr.	G/B 486 acetone burners	8 gr/hour Ag I per generator, 955 kg total/year	Convective clouds predominant base temp 0°C to 10°C and top temp to -20°C	Apr-Oct Number of days missing	Reports availble
FR-2	Hail Supp		ANELFA SW France	Hail Supp SW France	1952	Agr.	Same as above	Same as above	Same as above		C/B study
GERMANY, FEDERAL REPUBLIC OF											
GE-1	Hail R O	2400 km^2	Hail defense research near Rosenheim + Miesbach	11°40' E to 12°30' E on N Slope of Alps	1975 Yes	County	2 aircrafts 6 generators	8 kg/hour total consumption. 36 kg/year Ag I seeding criteria a function of temp advection wind speed, humidity fronts, radar echoes	Ground and cloud base seeding with aircraft	21 Days May-Sept	Compa- rison climatic records & crop damage no ana- lysis of C/B

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
GERMANY, FEDERAL REPUBLIC OF (continued)											
GE-2	Hail Supp	200 km^2 Target Control 400 km^2	Hail Supp Mühldorf Altötting	Bavaria Germany	1983 Yes	Local county seat Mühl-dorf	1 aircraft (Piaggio) ground generator pyrotechnic flares	4 liters/hour Ag I annual consumption 130 liters/year	Primarily cloud base seeding with cloud base warmer than 10°C operational decisions came from Munich Met. Office	May-Sept 30 Days	EIR C/B studies availble
GE-3	Hail Supp Op	Target 2450 km^2 Control 5000 km^2	Hail Supp Exp in Stuttgart area	SW Germany near Stuttgart 49°N 10°E	1980 Yes	Pri-vate Org. Agr.	1 aircraft pyrotechnic flares	75 gr Ag I/flare Total consumption 104 flares 75 kg Ag I	Cloud base seeding of cumulus clouds. Cloud base 10°C or warmer. Cloud tops -20°C or colder. $\geq$30 db and cloud top heights $>$ 25000 ft are favorable situations	25 Apr-15 Oct. 17 Days	
HUNGARY											
HU-1	Hail Supp	1200 km^2	Hail Supp of Baranya county S Hungary	Baranya County 45°48'-46°03'N 17°54'-18°37'E	1976 Yes	Ins. Co.	Rockets	500 gr PbI/rocket Total consumption per year 884 kg	In cloud seeding with cloud base temp colder than 10°C and cloud tops colder than -20°C and 40 dbz measured in clouds	Apr-Oct 21 Days	C/B studies made
HU-2	Hail Supp	1600 km^2	Hail Supp Project of Bacs-Kiskun Hungary	Bacs-Kiskun 46°-46°27'N 18°50'-19°25'E	1985 Yes	Ins. Co.	Rockets	500 gr Pb I/rocket Total consumption per year 768 kg	In cloud seeding with cloud base temp colder than 10°C and cloud top colder than -20°C and 40 dbz measured by 5 band radar	Apr-Oct 25 Days	C/B studies made
INDONESIA											
IN-1	PE Extend Wet Period	Target 4500 km^2 Control 1500 km^2	Hujan Buatan di Das citarum	Citarum river Catchment area West Java	1979 Yes	Gover-nment Hyd. Res.	5 aircraft solid dipersal dev. (salt) Liquid spray Dev.	4500 kg NaCl/day 800 liters/urea sol. per day	Cloud base in cloud releases (10°-12°) Cloud base temp are warmer than 0°C and cloud top temp. are warmer than 0°C	March 21 Days	
IN-2	PE 0 Extend wet period	2935 km^2	Huan Buatan di Soroako	Soroaka South Sulawesi	1988	Nickel mining Co.	4 aircraft liquid spray devise Solid dispersal	3500 kg/day NaCl 600 liters/day Urea solution	Convective cumulus cloud base + in cloud seeding at or near 10-12°C. Cloud base $\sim$10°C. Cloud tops$\sim$ 0°C	May-June 42 Days	Evalua-tion doc. planned and availble

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ITALY											
IT-1	Hail Supp	160 km^2	Colli Albani IT-2	Provincia di Roma	1986	Agr. Sylvi-culture	4 AgI + 1 mobile AgI gen.	4 x 100 gr/hour	Convective cumulus The general meteoro-logical situation and radar echos determine the seeding schedule	July-Aug 60 Days	
IT-2	Precip rain + snow	100 km^2	Bacino Idro-electrico Lumiei-Alto Tagliamento	Not specified	1974 1981 8 years		4 ground based generators burning Ag I in kerosene 1 aircraft	4 x 100 gr/hour	Cumulus, stratiform and frontal systems radar	Oct-April	Reports availble Quali-tatif results show decrease in preci pitation
IT-3	Hail Supp	1800 km^2	Difesa Antigrandine	Province of Vicenza	1972 1985 14 years		1 aircraft. 12 mobile AgI generators	100 gr/hour/AgI gen	Base of cloud treatment area. Radar provides seeding criteria	May-Sept	Rapport UCEA for 1976-79 issued by Minister of Agr.& Forests
IT-4	PE R	3500 km^2	Prosetto Puglia	Region Puglia Assessorato Agricultura	1986		1 aircraft. Ag I generator	600 gr/hour	Base of cloud treatment area cloud base temp $\sim$10°C. Cloud top temp $\sim$-20°C	March-May	Evalua-ation based on compari-son with climato-logy. Showed diminu-tion of rainfall
JORDAN											
JO-1	PE O	10000 km^2	Rain Enhancement Project	10 sectors distributed N-S. Five miles East of Jordan River	1986 Yes	Wea. Ser. Jordan Met. Dept. Res. Div.	1 aircraft. 14 gr 14 gr generators Pyrotechnic flares Liquid spray using Ammonium. Carbonate in distilled water	Flares 20 gr. each annual consumption 134.854 kg AgI	Release in cloud at -5°C to -20°C and ground seeding. Seeding convective, orographic, layer clouds Temp, ice crystal count + liquid water content are principal selection criteria	Nov-Dec 1987 Jan-March 1988	

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
JORDAN (continued)											
JO-2	PE O	10000 km^2	Rain Enhancement Project	10 sectors distributed N-S, 5 miles East of Jordan River	1986 1988 1989	Jordan Met. Dept. Res. Div.	1 aircraft. 20 ground generators $(NH_4)_2 CO_3$ liquid dispenser	Airborne: 120 gr/hour per generator Ground: 28.6 gr/hour per generator	Airborne seeding criteria -5°C to -20°C Seeding criteria determined by radar reflectivity aircraft measurements liquid water content ice crystal count, etc.	Nov. 88 - Apr. 89	Evaluation suggests an increase in precipitation
MOROCCO											
MO-1	PE Res Dev Drought	16400 km^2	Project Al Ghait Maroco American N 608-0190	Central + High Atlas Mtns	1984 Yes	Wea. Ser.	7 Ag I generators 2 Ag I pyrotechnic fusées. Aircraft	20 ga/hour AgI in solution and 375 ga/hour in the aircraft. Total AgI per season: 53,540 kg NaCl: 6 gal/hour, 115 gal/hour. Total 15,490 kg Propane 2 kg/hour Total 4725 kg	Acceptable temp. criteria cloud base + 10°C. Cloud top -20°C Liquid water content 1 gr/m^3 for 10 km; 3 gr/m^3 for some distance; 5 gr to 1 gr/m^3 for cumulus congestus	Nov-Dec 1987 Jan-Apri 1988 36 Days	
NORWAY											
NO-1	Fog Disp	5-10 km^2	Oslo Airport Fornebu Oslo Airport Moen	Airport in Oslo, Norway	1964 Yes	Trans	Aircraft. Solid dispersal	100-150 kg CO_2 for each seeding event	Cloud top and in cloud with temp below -1°C desirable temp. regime at cloud base - 3°C to - 10°C effectiveness mainly a function of cloud temperature	Jan-March Nov-Dec	
THAILAND											
TH-1	PE O Drought Water Supply Redistribution	3000 km^2	Northeast Green Project	NE areas of Thailand	1988 Yes	Ministry of Agr. and Military	Aircraft. Solid Dispersal Device for cloud top and cloud base seeding	NaCl: 2,000 kg/hr Total per year: 108,500 kg Dry ice: Coolant mixture. Total: 21,000 kg/year NH_4NO_3: 2,000 kg/hr Total: 110,100 kg CaCl: 4,000 kg/hr Total: 41,900 kg CaO: 4,000 kg/hr Total: 30,650 kg CaC_2: 4,000 kg/hr Total: 22,900 kg T.1: 2,000 kg/hr Total: 23,800 kg	Convective clouds seeded in favorable weather conditions with cloud bases warmer than + 10°C and cloud tops colder than 0°C but warmer than -20°C	May-Oct 1988. This activity is yearly called! The Thailand Applied Atmosphere Resource Research Programme	Report Fifth WMO Sc. Conf on Wea. Mod. in Beijing China

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNION OF SOVIET SOCIALIST REPUBLICS											
SU-1	PE Water Supply O	5000 km^2	Cloud seeding for precipitation enhancement	The Ukrainian SSR	1985 Yes	Agr. Wea. Serv.	Aircraft with pyrotechnic cartridges explosive type generator and H_2CO_3		AgI cloud top seeding of layer clouds with cloud top temp colder than 0°C but warmer than -20°C and vertical extent of clouds > 500m cloud base temp colder than + 10°C	Jan-Feb Nov-Dec	Comparison with historical record evaluation Doc availble
SU-2	PE Aug. Water Supply O	6000 km^2	Cloud seeding for precip. enhancement	The Georgian SSR	1985 Yes	Ag. Wea. Serv.	Explosive rockets and artillery shells and explosive pyrotechnic flares releasing Ag I	Explosive dispersal of Ag I + pyrotechnic flares	In cloud seeding at temp. -6°C to -10°C Seeding convective clouds (cumulus) with cloud base temp. colder than + 10°C and cloud top temp. colder than - 20°C vertical extent of clouds > 2 km	May-Sept	Evaluation is comparison with historical record evaluation planned EIS and C/B study made
SU-3	PE Water Supply	2000 km^2	Cloud seeding for precip. enhancement	The Uzbek SSR	1985 Yes	Agr. Wea. Serv.	Aircraft and rocket delivery of pyrotechnic flares and H_2CO_3	AgI seeding for in cloud and ontop seeding at -4°C to -10°C temp. also H_2CO_3 treatment	Seeding layer type clouds with cloud bases colder than + 10°C and cloud top temp. colder than 0°C but warmer than -20°C	Feb-March	Evaluation based on comparison with historical record Evaluation made availble EIS was made availble C/B study was prepared

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNION OF SOVIET SOCIALIST REPUBLICS (continued)											
SU-4	Fog dispersal O	3500 x 500 m x 100m	Dispersion of supercooled fog over airfields	Kishinev airport, the Moldavian SSR	1985 Yes	Wea. Serv. Trans.	Ground equipment disbursing liquid nitrogen		Treating supercooled fog with cloud base temp colder than 10°C and cloud top temp colder than 0°C but warmer than -20°C Temp. conditions wind speed and presence of supercooled water in fog determine seeding potential	Jan-March Nov-Dec	Evaluation doc planned but not availble EIS, C/B study made and available
SU-5	Hail R	2500 km^2 Target Control 3000 km^2	Complex hail supp experiment	The Kabardino Balkarian ASSR (North Caucasus)	1983 Yes	Res. Foundation Wea. Serv.	Rockets and artillery shells and explosive pyrotechnic flares	In cloud seeding	Ag I seeding between -6°C and -10°C of convective clouds with cloud base colder than +10°C and cloud top temp. colder than -20°C Criteria used to select days is ratio of reflectivity for two wavelength $\frac{Z\ 3.2}{Z\ 10} < 1$ and probability of hail deposition is $P_H > 0.4$	May-Aug	Physical effect determin need to evaluate C/B study has been made
SU-6	Hail Supp O	13800 km^2	Hail Supp	The Azerbaijan SSR	1967 Yes	Agr. Wea. Serv.	AgI rockets + artillery shells	In cloud seeding by exploding pyrotechnic flares and artillery shells within -6°C to -10°C layer	Seeding in layer between -6°C to -10°C of convective clouds with a cloud base temp. colder than + 10°C and cloud top temp. colder colder than -20°C. Seeding indicated when prob. of hail deposition is $P > 0.4$ and when ratio of reflectivity is $\frac{Z\ 3.2}{Z\ 10} < 1$	April-Oct 58 Days	Evaluation made by comparison with historical records

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNION OF SOVIET SOCIALIST REPUBLICS (continued)											
SU-7	Hail Supp	11450 km^2	Hail Supp	The North Caucusus	1967 Yes	Agr. Wea Serv.	Rockets pyrotechnic flares	In cloud release of AgI	Convective cloud seeding at -3°C - -15°C with cloud base temp. warmer than + 10°C and cloud top temp. colder than - 20°C when probability of hail deposition $P > 0.4$ and when $\frac{Z\ 3.2}{Z\ 10} < 1$ are criteria for treatment	May-Sept 61 days	
SU-8	Hail O.	7700 km^2	Hail supp	The Krasnodar Territory	1967 Yes	Agr. Wea. Serv.	Rockets and shells explosives + pyrotechnic flares	Not available with in cloud explosives	In cloud seeding in -6°C - - 10°C region with AgI convective clouds with cloud base temp. warmer than + 10°C and cloud top temp colder than -20°C Clouds selected for treatment when prob. for hail deposition is $P > 0.4$ and when $\frac{Z\ 3.2}{Z\ 10} < 1$	May-Sept. 47 Days	Evaluation based on comparison with historical records Evaluation doc planned but not availble EIS made but not C/B
SU-9	Hail O	5010	Hail Supp	The Crimea Region of Ukrainian SSR	1968 Yes	Agr. Wea. Serv.	Rocket with pyrotechnic flares	unknown	In cloud seeding with AgI between -6°C and -10°C of convective clouds with cloud base temp. warmer than + 10°C and cloud top temp colder than -20°C. clouds are selected for treatment when prob. for hail deposition is $P > 0.4$ and when $\frac{Z\ 3.2}{Z\ 10} < 1$	May-Sept. 37 Days	Evalua tion based on com parison with histo- rical records Evalua- made but not availble C/B study availble

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNION OF SOVIET SOCIALIST REPUBLICS (continued)											
SU-10	Hail	10030 km^2	Hail Supp	The Armenian SSR	1964 Yes	Agr. Wea. Serv.	Rockets and Artillery shells with explosive and pyrotechnic AgI material for in cloud seeding	Unknown	In cloud seeding with AgI between -6°C and -10°C of convective clouds with cloud base temp. colder than + 10°C and cloud top temp. colder than -20°C. Clouds are selected for treatment when prob for hail deposition is $P > 0.4$ and when $\frac{Z\ 3.2}{Z\ 10} < 1$	Apr-Oct 71 days	Comparison with historical records basis for evaluation Evaluation doc planned not availble C/B study made
SU-11	Hail 0	4015 km^2	Hail Supp	The Odessa Region, the Ukrainia SSR	1980 Yes	Agr. Wea. Serv.	Rocket with pyrotechnic flares devises		In cloud seeding with AgI between -6°C and -10°C of convective clouds with cloud base temp. warmer than + 10°C and cloud top temp colder than -20°C. clouds are selected for treatment when prob. for hail deposition is $P > 0.4$ and when $\frac{Z\ 3.2}{Z\ 10} < 1$	May-Sept. 23 Days	Comparison with historical records basis for evaluation Evaluation doc planned but not for distribution EIS and C/B planned
SU-12	Hail Supp	23600 km^2	Hail Supp	The Moldavian SSR	1964 Yes	Agr. Wea. Serv.	Rocket with pyrotechnic flares		In cloud seeding with AgI between -6°C and -15°C of convective clouds with cloud base temp. colder than + 10°C and cloud top temp colder than -20°C. clouds are selected for treatment when prob. for hail deposition is $P > 0.4$ and when $\frac{Z\ 3.2}{Z\ 10} < 1$	May-Sept. 47 Days	Comparison with historical records basis for evaluation Evaluation doc planned EIS and C/B study made

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNION OF SOVIET SOCIALIST REPUBLICS (continued)											
SU-13	Hail O	12500	Hail Supp	The Georgian SSR	1964 Yes	Agr. Wea. Serv.	Rocket and artillery shells with pyrotechnic and explosive AgI charges	unknown	In cloud seeding with AgI between -6°C and -10°C of convective clouds with cloud base temp. colder than + 10°C and cloud top temp colder than -20°C. clouds are selected for treatment when prob. for hail deposition is $P > 0.4$ and when $\frac{Z\ 3.2}{Z\ 10} < 1$	June-Oct. 81 Days	Comparison with historical records basis for evaluation Evaluation doc planned but not for distribution EIS and C/B study made
SU-14	Hail O	8600 km^2	Hail Supp	The Uzbek SSR	1967 Yes	Agr. Wea. Serv.	Rocket and artillery shells with pyrotechnic and explosive AgI charges	unknown	In cloud seeding with AgI between -6°C and -10°C of convective clouds with cloud base temp. warmer than + 10°C and cloud top temp colder than -20°C. clouds are selected for treatment when prob. for hail deposition is $P > 0.4$ and when $\frac{Z\ 3.2}{Z\ 10} < 1$	Apr-Sept. 56 Days	Comparison with historical records basis for evaluation Evaluation doc planned but not for distribution EIS, C/B study made
SU-15	PE dist water supply R	10000 km^2	Study of the possibility for precip. enhancement	Penza region The Russian FSSR	1982 Yes	Res. found	2 aircraft with explosive type device for AgI and with H_2CO_3		Cloud top seeding of convective and layer clouds with cloud base temp. for convective clouds warmer than + 10°C and cloud base temp. for stratiform clouds colder than 10°C. Generally cloud top temp. for layer clouds lower than 0°C but warmer than -20°C Criteria for treatment depend on temp. conditions, and presence of supercooled water	May-July Nov-March	This is randomized experiment Evaluation doc planned but not for distribution EIS and C/B study has been made

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNION OF SOVIET SOCIALIST REPUBLICS (continued)											
SU-16	Hail Supp O	7000 km^2	Hail Supp	The Tajik SSR	1964 Yes	Agr. Wea. Serv.	Rocket and artillery shells with pyrotechnic and explosive AgI charges	unknown	In cloud seeding with AgI between -6°C and -10°C of convective clouds with cloud base temp. warmer than + 10°C and cloud top temp colder than -20°C. clouds are selected for treatment when prob. for hail deposition is $P > 0.4$ and when $\frac{Z\ 3.2}{Z\ 10} < 1$	Apr-Sept. 33 Days	Comparison with historical records basis for evaluation Evaluation doc planned but not for distribution EIS, C/B study has been made
UNITED STATES OF AMERICA											
US-1	Fog Disp	10 mil^2	United Airlines Medford, Or.	Medford Oregon Airport	n/a	Airline	Aircraft aperatus for CO_2 dispenser	6011 (lbs) 3437 (lbs)	Seed a circle approx. 3 mi. dia. around Medford Airport	5 days 8 days	n/a
US-2	PE(S)	1600 mil^2	Bear River RC + D, Logan Utah, North Am. Wea. Cons. Operator	Bear River, Utah	New n/a	Private Elect. Utility	20 propane Ag I generators ground based	6 gr/hour Ag I Total disbursed 2766 gm	n/a	6 days	n/a
US-3	PE(S)	100 mil^2	Vail Assoc.	Vail + Beaver Creek Ski Area	n/a	Comm.	Ground based 10 Ag I - NH_4I generators	5-20 gr/hour	n/a	1/88 8 days 11/12/88 21 days	n/a
			Town of Vail	Colorado	n/a						
			Beaver Creek	Colorado	n/a						
			Town of Avon	Colorado	n/a						
US-4	PE	1200 mil^2	Atmospheric Incorp.	North Kern Water Storage District	n/a	P	Ejectable pyrotechnics Ag I generator	8430 gm 2115 gm 60-10000 gr/hour dispensing rate	n/a	1-5/88 14 days 11-12 88 6 days	n/a
US-5	PE	100 mil^2	Southern Cal. Edison CO.	Catalina Is.	88	Comm.	Aircraft aperature aerial release	1-2 lbs/mile CO_2 565 lbs/dispensed	n/a	12/88 3 days	n/a

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNITED STATES OF AMERICA (continued)											
US-6	PE(S)	1500 mil^2	Utah Water Resources Dev. Corp	Above 7500' in Weber, Provo County, Utah	88	State of Utah	20 propane/AgI generators	6 gr/hour 2369 gm	n/a	11-12/88 7 days	n/a
US-7	PE(S)	5000 expand to 10000 mil^2	Utah Water Resources Dev. Corp.	Higher elev in Central and SW Utah	86	State of Utah	20 ground based expanded to 50 propane burning AgI generators	6 gr/hour 10425 gm and 8016 gm	n/a	1-4/88 18 days 11-12/88 13 days	n/a
US-8	PE(S)	200 mil^2	Utah Water Resources Dev. Corp	Wasatch Mtns east of Salt Lake City	88	State of Utah	16 ground based Ag I generators	6 gr/hour 8093 gm consumed	n/a	11-12/88 21 days	
US-9	PE	1200 mil^2	Dept. of Water and Power Los Angeles CA	East Slope Central Sierra Mnts, CA	87	State of Cali-fornia	Aerial release of ejectable pyrotechnics	60-6000 gr/hr of AgI. Total amount used 3010 gm and 3460 gm respectively	n/a	1-5/88 11-12/88 13 and 7 days respec-tively	
US-10	PE(S)	100 mil^2	Sun Valley CO, Sun Valley Idaho	Mt. Baldy Ski Area. Sun Valley, Idaho	85	Comm.	Aerial release of ejectable pyrotechnics (Ag I)	200-300 gr/hour Total dispensed 3920 gm + 9125 gm respectively	n/a	1/88 8 days 11-12/88 19 days	n/a
US-11	PE	900 mil^2	Nevada State Wea. Mod. Prog. Desert Res. Institute	Western Ruby Mtns Watershed	87	Nevada State	Ground based 6 propane Ag I - CH_3COCH_3 generators	n/a 2664 gm and 3584 gm	n/a	1-5/88 11-12/88 26 and 19 days respec.	n/a
US-12	PE	1500 mil^2	Nevada State Wea. Mod. Prog. Desert Res. Institute	Walker and Carson River Watershed	87	Nevada State	Aerial release and 3 Ag I - CH_3COCH_3 generators	aerial release 200 gr/hour; ground based n/a Total dispersion 5086 gm 3014 gm	n/a	1-6/88 31 days 11-12/88 25 days	n/a
US-13	PE	1500 mil^2	Nevada State Wea. Mod. Prog. Desert Res. Institute	Truckee River Watershed	87	Nevada State	Ground based and Aerial release 6 propane burning Ag I - CH_3COCH_3 and Ag I flares	Areal release 200 gr/hour Total dispersion 10398 gm and 15001 gm	n/a	1-4/88 14 days 11-12/88 18 days	n/a

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNITED STATES OF AMERICA (continued)											
US-14	PE	1200 Sq. mile	Southern CA Edison CO	San Joaquim River Watershed		Electric Co	Aerial release and ground based 14 AgI generators	10-30000 gr/hour Total dispersal 23897 gm	n/a	1-12 /88 64 days	
US-15	PE	2225 Mil^2	Kings River Conservancy District	Kings River Watershed	New 88	Water Co	Ground based 10 AgI generators + wing tip Ag I generators	Ground based 6-9 gr/hour; Areal release 120-180 gr/hour	n/a	12/88 8 days	
US-16	PE(S)	1000 mil^2	Utah Power + light Salt Lake City Utah	Smith Fork Thomas Fork of Bear River Water	New	Electric	Ground based 12 Ag I generators	72 gr/hour Total 2432 gm	n/a	11-12/88 6 days	
US-17	PE	3500 mil^2	Santa Barbara County Water Agency	South Coastal San Luis Obispo County, North Coastal Santa Barbara County	87	County Government	Ground based + aerial release. 10 Ag I generators + 2 wing tip generators	Ground based 9 gr/hour aerial release 180 gr/hr	n/a	1-3/88 and 11-12/88 5 and 8 days respect.	
US-18	PE	500 mil^2	Kaweah Delta Water Conservation Dist.	Kaweah River Watershed west slope of Central Sierra Nevada Mtns	87	Water District	Areal pyrotechnic 6 Ag I generators ejectable pyrotechnics	60-30000 gr/hr 6403 and 2365 gm respectively Amount of agent	n/a	1-5/88 and 11-12/88 19 and 14 days respect.	
US-19	PE(S)	500 mil^2	Pacific Gas and Electric Co.	Lake Almanor N. Sierra Nevada Mtns California	87	Electric Power	9 CH_3COCH_3 AgI and AgI - NH_4I generators	225 gr/hour CH_3COCH_3-AgI and AgI NH_4I Total amount of agent 11950 gm	n/a	11-12/88 16 days	
US-20	PE(S)	250 mil^2	Pacific Gas and Electric Co	Mokelumne Central Sierra Nevada Mtns	87	Electric Power	5 ground based CH_3COCH_3 - AgI and AgI - NH_4I generators	125 gr/hr CH_3C, O, CH_3-AgI and AgI NH_4I. Total consumed 10525 gm	n/a	11-12/88 18 days	
US-21	PE	236 mil^2	Sacramento Municipal Utility Dist.	American River watershed	79	Electric Power	Ground based 8 CH_3COCH_3 - AgI and AgI - NH_4I generators	160 gr/hr. Total agent used 10622 gm in CH_3COCH_3 - AgI NH_4I generators	n/a	11-12/88 17 days	

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNITED STATES OF AMERICA (continued)											
US-22	F	2 mil^2	USAF Fairchild AFB Washington	Fairchild AFB runways	87	Military	Ground based 23 17 20 ft dispensing wands for propane gas	Disbursing at 230 gal/hour propane 3276 gal + 5832 gal respect.	n/a	1-3/88 and 11-12/88 9 and 12 days resp.	
US-23	F	2 mil^2	USAF Elmendorf AFB Alaska	Elmendorf AFB runways	87	Military	Ground based 24 17-20 ft dispensing wands for propane gas	Disbursing 1717 gal + ogal respectively at a rate of 432 gal/h	n/a	Cold fog 1-2/88 10-12/88 3 and 0 days resp	
US-24	PE	3000 mil^2	Southwestern Ohio Broad casting	SW Ohio	New	Private	Aerial release of pyrotechnics with Ag I	10 gr and 20 gr ejectables. Total released 6000 gm	n/a	7-8/88 17 days	
US-25	PE	1000 mil^2	Red Bluff Water Power Control dist. Pecos Texas	Texas portion of Red Bluff Lake Watershed	83	Local Government	Ground based 13 AgI arc type generators	26 gr/hour 766 gm total	n/a	9-12/88 22 days	
US-26	PE	84 mil^2	Hitch Agri-business Inc. Guymon, OK	Texas County OK	87	Agr.	Ground based 10 AgI arc type generators	20 gr/hour 1881 gm total dispensed	n/a	6-12/88 85 days	
US-27	Hail PE	6812 mil^2	N. Dakota Atmospheric Resource Board Bismark N.D.	Northwestern N.D. Dist. II	87	Agr.	Aerial release Ag I - NH_4I generators ejectable pyrotechnics dry ice dispenser	For hail mitig. 10-100 nuclei/liter For PE 1 nuclei/liter Amount dispensed 17 373 gm/AgI 971-lbs/CO_2	n/a	6-8/88 26 days	
US-28	Hail PE	3350 mil^2	N. Dakota Atmospheric Resource Board Bismark N.D.	Southwestern N.D. Dist. I	87	Agr.	Aerial release Ag I - NH_4I generators ejectable pyrotechnics dry ice	For hail mitig. 10-100 nuclei/liter For Prec. increases 1 nuclei/liter Amount dispensed 20 989 gm/AgI 974-lbs/CO_2	n/a	6-8/88 21 days	

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNITED STATES OF AMERICA (continued)											
US-29	Hail PE	12000 Mil^2	Western Kansas Groundwater Management District Scott city KS	West Central and SW Kansas	87	Agr.	Aerial release AgI generators. Dry Ice dispenser	AgI: 126 liters/min Dry Ice: 1-2 lbs/min Amount released 42, 432 gm/AgI 3779 lbs/CO_2	n/a	4-11/88 58 days	
US-30	PE	4500 mil^2	City of San Angelo, Texas	West Central Texas	87	Water Supply	Aerial release Ag I generators Ag I ejectable pyrotechnics	150-225 gr/hr from generator 10-20 gr Ag I from pyrotechnics 9404 gm total emitted	n/a	4-10/88 31 days	
US-31	PE(S)	600 mil^2	Salt Lake City Water Division Salt Lake City Utah	East Salt Lake County, Utah	New	Water Supply	Ground based 16 propane burning Ag I generators	96 gr/hr Ag I Total dispersed 10826 gm	n/a	3-5/88 18 days	
US-32	PE	3500 mil^2	Colorado River Municipal Water Dist. Big Springs Texas	West Central Texas	87	Water Supply	Aerial release Ag I generator	2.8 to 7.1 gr/min Total dispersed 3652 gm	n/a	5-9/88 23 days	
US-33	F	1 mil^2	Northwest Orient Airlines Spokane Wa	Runways at Spokane Int. Airport	85	Comm.	Aerial release aircraft aperature for CO_2 release	CO_2 (dry ice) 6 lbs/mile Total dispersed 2200 lbs and 12300 lbs respect.	n/a	Fog dispersal 1-2/88 & 11-12/88 3 and 5 days respect.	

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
YUGOSLAVIA											
YU-1	Hail Supp Fog Dis-persal	86000 km^2 30 km^2	Hail Supp + supercooled Fog Modification	Hail Supp: E part of Slovenia NW and E part of Croatia, Bosna, Herce-govina, S part of Serbia, Macedonia Supercooled fog at Kolubara region only	1967 Yes	Ag. Fores-try. Fores-try Wea. Serv.	Rockets (hail) pyrotechnic flares hail in cloud seeding at -6°C to -15°C 20 ground generators liquid spray for fog	5-15 gr/km^3 AgI Total dispersion: 300-1410 kg/season	Convective clouds Cloud bases 10°C cloud tops -20°C Seeding criteria SR Slovenia Z $\geq$ 40 dbz at height 0°C to 1.4 km^2. SR Croatia: Top alt of radar echo $>$ -28°C isotherm Z $\geq$ 45 dbz reflectivity zone $>$ 0°C + 1.4 km SR Serbia: radar observation S Macedonia Log Z $>$ 3 + HV $<$ 28°C + HVZ $<$ -14°C	15 Apr-15 Oct (Hail) 30-42 Days 1 Dec-1 March (Fog) 24 Days	Evalua-tion planned and made availble
ZIMBABWE											
ZM-1	Precip Enh. Water supply	3000 km^2	National Cloud seeding operation Nasco	Carried out over entire country	1973	Wea. Serv.	1 Aircraft Pyrotechnic flares	Total consumption of AgI - Pyro's - 137 cartridges of TB 2 to seed 114 clouds	Convective cloud top + in cloud seeding at ~-10°C; cloud base temps are generally warmer than + 10°C and cloud top temps are generally colder than 0°C but warmer than -20°C. Seeding decisions based on Tephigram analysis and developments	Feb-Nov 1988 14 April 1989 56 Days	C/B study made and are availble

IX-ADDRESSES OF REPORTING AGENCIES

ARGENTINA	DILAG Direccion de Investioacion de Lucha Antigranizo Casa de Gobierno B.P. Central 5500 MENDOZA
AUSTRALIA	CISRO Division of Atmospheric Research Private Bag No. 1 MORDIALLOC, Vic. 3195
AUSTRIA	Central Institute for Meteorology and Geodynamics Dept. of Climatology Hohe Warte 38 1190 VIENNA
BRAZIL	FUNCEME Av. Bezerra de Menezes 1990 60325 FORTALEZA CEARA
CHILE	Servicio Agricola y Ganadero Telecomunicaciones del agro Avda - Bulnes 140 SANTIAGO
CHINA	Meteorological Bureau of Hubei Province Precipitation Office P.C. 430074 WU HAN, Hubei Province
	Heilongjiang Provincial Meteorological Bureau No. 222 Zhuongshan Road Nangang District HARBIN, Heilongjiang
	Weather Modification Office No. 100 Meteorological Road TIANJIN
	Weather Modification Office of Shoan Xi Leading Group on Weather Modification No. 184 Beiguanzhengjie XIAN, Shoan Xi
	Ning Xia Meteorological Bureau Luojia Village Western Suburb YINCHUAN

CUBA	Instituto de Meteorologia Dpto de Influencia Activa y Fisica de las Nubes Apartado 17032 HABANA 17
FRANCE	ANELFA 52 rue Alfred Duméril 31400 TOULOUSE
GERMANY, FEDERAL REPUBLIC OF	Deutscher Wetterdienst - Zentralamt Frankfurter Str. 135 6050 OFFENBACH AM MAIN
HUNGARY	Meteorological Service of the Hungarian People's Republic P.O. Box 38 H-1525 BUDAPEST
INDONESIA	Meteorological and Geophysical Agency Tromol Pos 3540 JKT JAKARTA 10340
ITALY	SOREM arl Via Pasubio 11 00195 ROMA
JORDAN	Jordan Meteorological Department Research Division Marka/P.O. Box 341011 AMMAN
MOROCCO	Météorologie Nationale Programme Al-Ghait Division du Développement et de la Recherche B.P. 8106 CASA/OASIS CASABLANCA 02
NORWAY	Norwegian Meteorological Institute P.O. Box 43 Blindern 0313 OSLO 3
THAILAND	The Royal Rainmaking Research and Development Institute Inside Kasetsart University Bangkhen BANGKOK 10900

USSR	USSR State Committee for Hydrometeorology and Control of Natural Environment 12, Pavlik Morozov Street 123376 MOSCOW
USA	National Oceanic and Atmospheric Administration 6010 Executive Blvd. ROCKVILLE, MD 20852
YUGOSLAVIA	Federal Hydrometeorological Institute Bircaninova 6 P.O.B. 604 11000 BEOGRAD
ZIMBABWE	Dept. of Meteorology Services Box BE 150 Belvedere HARARE

X-REGISTER OF NATIONAL WEATHER MODIFICATION PROJECTS

List of Members reporting NO weather modification projects in 1988

BARBADOS
BELGIUM
BELIZE
BENIN
BOTSWANA
BRUNEI
BURMA
CAMEROON
CANADA
CHAD
COLOMBIA
CZECHOSLOVAKIA
DOMINICA
FIJI
FINLAND
FRENCH POLYNESIA
GERMAN DEMOCRATIC REPUBLIC
GUINEA-BISSAU
GUYANA
HAITI
ICELAND
INDIA
IRELAND
JAPAN
KOREA
KUWAIT
LAO PEOPLE'S DEMOCRATIC REPUBLIC
LESOTHO
LUXEMBOURG
MADAGASCAR
MALAWI
MONGOLIA
MOZAMBIQUE
THE NETHERLANDS
NEW CALEDONIA
NEW ZEALAND
NICARAGUA
NIGERIA
PAKISTAN
PANAMA
POLAND
QATAR
ROMANIA
RWANDA
SAUDI ARABIA
SENEGAL
SEYCHELLES
SINGAPORE
SRI LANKA
SUDAN
SWEDEN
SWITZERLAND
SYRIAN ARAB REPUBLIC
TANZANIA, UNITED REPUBLIC OF
TRINIDAD AND TOBAGO
TURKEY
UGANDA
UNITED KINGDOM
URUGUAY
VANUATU

W O R L D M E T E O R O L O G I C A L O R G A N I Z A T I O N

R/CLA/4, ANNEX A
FORM (1 JANUARY 1988)

CLOUD PHYSICS AND WEATHER MODIFICATION RESEARCH PROGRAMME

QUESTIONNAIRE
TO GATHER DATA FOR THE 1988
REGISTER OF NATIONAL WEATHER MODIFICATION PROJECTS

PLEASE MARK APPROPRIATE BOXES

MEMBER OF WMO .....

No weather modification activities in 1988 /__/

(Please return this form even if no weather modification activities have taken place this year).

1. TYPE (PURPOSE) OF WEATHER MODIFICATION ACTIVITY OR PROJECT:

(a) Precipitation enhancement ..... /__/

Activity is response to emergency (e.g., droughts) ..... /__/

Activity is for routine water supply augmentation ..... /__/

Goal is to extend wet period ..... /__/

Goal is to increase precipitation during wet period ..... /__/

(b) Precipitation redistribution ..... /__/

(c) Hail suppression ..... /__/

(d) Fog dispersal ..... /__/

(e) Other (please specify): .....

2. THIS IS PRIMARILY A (Research ..... /__/) ACTIVITY
(Development ... /__/)
(Operational ... /__/)

3. PROJECT AREA

(a) Approximate size of the project target area (km^2): .....

(b) Approximate size of the control area (if used) (km^2): .....

ANNEX A, p. 2

4. NAME AND/OR REFERENCE OF PROJECT: .....

.....

5. LOCATION OF AREA IN WHICH PROJECT IS CARRIED OUT:

.....

6. PROJECT HISTORY

(a) Year project started: .....

(b) Has project been implemented each year since it was started?

Yes /__/ No /__/ Not known /__/

(c) Is it expected to continue during the coming year?

Yes /__/ No /__/ Not known /__/

7. NATURE OF ORGANIZATION SPONSORING PROJECT
(Please place X in appropriate box)

ACTIVITY OF ORGANIZATION	GOVERNMENT	PRIVATE
Agriculture		
Energy		
Forestry		
Hydrology		
Research Foundation		
Transportation		
Weather Service		
Other (please specify)		

8. PROJECT ACTIVITY THIS YEAR

(a) During the current reporting year, what months did seeding or other weather modification activity take place?

.....

(Note: if reporting period extends over two years, as it might if a project spanning December and January is being reported, please indicate the years being reported, one example might be: December 1987, January-February 1988; another might be: January-February 1988, December 1988).

(b) On how many days did this activity take place? .....

9. DESCRIPTION OF WEATHER MODIFICATION APPARATUS, MODIFICATION AGENT AND THEIR DISPERSAL RATES, TECHNIQUES EMPLOYED, ETC. (see instructions)

(a) Seeding delivery system:

Ground /__/ ..... How many generators? /__/

Aircraft /__/ ..... How many aircrafts? /__/

Rockets /__/ Artillery shells /__/

Other (please specify): .....

(b) Type of Generator:

Acetone burner /__/ Pyrotechnic flare /__/

Explosive /__/ Liquid spray /__/

Solid dispersal /__/ Other : .....

(c) Location of release of seeding material:

Ground /__/ Cloud base /__/

Cloud top /__/ In-cloud /__/

If release is in-cloud, at what temperature or other criterion?

.....

.....

Seeding Material	Rate of Consumption (give units)	Total Consumption during this year (kg)
AgI	.....	.....
PbI_2	.....	.....
Dry Ice	.....	.....
NaCl	.....	.....
Propane	.....	.....
.....		
.....		
.....		

10. CHARACTERISTICS OF CLOUDS TREATED:

(a) Convective (cumulus) /__/ Orographic /__/ Layer (stratiform) /__/

(b) Generally, the cloud base temperatures (°C) are:

Warmer than +10°C /__/ Colder than +10°C /__/

(c) Generally, the cloud top temperatures are:

Warmer than 0°C /__/

Colder than 0°C but warmer than -20°C /__/

Colder than -20°C /__/

(d) Criteria used to select days or clouds for treatment:

.....

.....

.....

11. PROVISIONS FOR EVALUATION

(a) None /__/

(b) Randomized experiment /__/

(c) Comparison with historical records /__/

(d) Crop damage /__/ Hail pads /__/

(e) Other: .....

(f) Is a document on the evaluation available or planned? YES /__/ NO /__/

(g) If so, is it available to WMO? YES /__/ NO /__/

12. MISCELLANEOUS

(a) Was an environmental impact study prepared for this project? YES /__/ NO /__/

(b) Has an analysis been made of the expected (or actual) costs and benefits? YES /__/ NO /__/

13. ORGANIZATION IN CHARGE OF PROJECT:

(a) Name of key technical person: .....

(b) Organization: .....

(c) Postal address: .....

.....

.....

14. OPTIONAL REMARKS:

.....

.....

.....

.....

15. REPORTING AGENCY:

(a) Name of reporting agency: .....

(b) Official title of responsible office: .....

.....

(c) Postal address: .....

.....

.....

.....

.....

....

(Signature) (Date)

Please complete and return this questionnaire as soon as possible, and in any case not later than 31 August 1989:

The Secretary-General
World Meteorological Organization
41, Avenue Giuseppe-Motta
Case postale 2300
1211 GENEVA 2
Switzerland

NOTES FOR COMPLETING REPORT ON WEATHER MODIFICATION ACTIVITIES

Weather modification activities which should be included in the Register

The seeding or dispersing into clouds or fog of any substance with the object of altering drop-size distribution, producing ice crystals or the coagulation of droplets, altering the development of hail or lightning, or influencing in any way the natural development cycle of clouds or their environment.

Any other activity performed with the intention of producing artificial changes in the composition, behaviour or dynamics of the atmosphere.

For example :

(a) The use of fires or heat sources to influence convective circulation or to evaporate fog;

(b) The modification of the solar radiation exchange of the earth or clouds, through the release of gases, dusts, liquids or aerosols into the atmosphere;

(c) The modification of the characteristics of land or water surfaces by dusting or treating with powders, liquid sprays, dyes, or other materials;

(d) The releasing of electrically charged or radioactive particles, or ions, into the atmosphere;

(e) The application of shock waves, sonic energy sources, or other explosive or acoustic sources to the atmosphere;

(f) The use of aircraft and helicopters to produce downwash for fog dispersal as well as the use of jet engines and other sources of artificial wind generation;

(g) The use of lasers or other sources of electromagnetic radiation.

Weather modification activities which need not be included in the Register

Activities of a purely local nature, such as the use of lightning deflection or static discharge devices in aircraft, boats, or buildings, or the use of small heat sources, fans, fogging devices, aircraft downwash, or sprays to prevent the occurrence of frost in tracts or fields planted with crops susceptible to frost or freeze damage.

Note: One completed copy of this form is requested for each weather modification activity (hereafter referred to as the project).

ANNEX A, p. 8

ADDITIONAL EXPLANATION
OF QUESTIONS FOR THE
REGISTER OF NATIONAL WEATHER MODIFICATION PROJECTS

ITEM 1 - Mark (X) in the box that corresponds to purpose of activity. By project is meant a related series of weather modification activities having a common objective and conducted at a particular location.

ITEM 2 - Mark (X) in the box corresponding to goal of the activity:

- Research - investigating scientific questions;
- Development - field work to optimize procedures;
- Operational - field work intended directly for economic benefits.

ITEM 3 - The Target Area is the area over which an effect is sought. The Control Area (or Areas) are areas that are chosen so as to be unaffected by the seeding material and used to evaluate results within the Target Area.

ITEM 4 - Enter the name and/or reference of projects used by operator. If the project was reported in the previous Register, please quote the WMO Register number which appears in column 1.

ITEM 5 - Indicate the location of the weather modification project by geographical co-ordinates and name of the region.

ITEM 6 - (a) Enter the year in which the first activities under the present project took place;

(b) Indicate if there were breaks in activities or if activities took place each year since it was started;

(c) Indicate whether the project is expected to continue by marking (X) in the appropriate box.

ITEM 7 - Indicate the principal interests of the organization that funds the project by marking (X) in the appropriate box (use multiple marks if appropriate).

ITEM 8 - During what months did the project operate in the field and on how many days did operations take place? Any other information related to the scope of the activity would be helpful. In some cases projects span two years. It is desirable that the portion conducted only within the reporting year be included in the Register for a particular year. If this is not practical, please indicate the years in which the activities took place, for example, December 1987, January-February 1988.

ITEM 9 - By weather modification apparatus is meant any apparatus used with the intention of producing artificial changes in the composition, behaviour or dynamics of the atmosphere. For example: AgI smoke generators, propane devices, flares, rockets, artillery projectiles, jet engines, etc.

(a) Seeding delivery system. Indicate, by marking (X) in the appropriate box, the nature of the delivery system, ground based, airborne, etc.;

(b) Indicate the way the seeding material is prepared for dispersal (e.g., by burning an acetone solution of silver iodide complex). Solid dispersal refers to the release of pellets (e.g., dry ice), powder (e.g., NaCl), etc.;

(c) Indicate the location at which seeding material is dispersed;

(d) Indicate what seeding material is used and the rate of dissemination (mass per unit of time, mass per cloud, etc.). Indicate total amount of material dispensed during the reporting period in kilograms.

ITEM 10 - (a) Indicate, by marking (X) in the box, the general characteristics of the clouds that are selected for treatment;

(b) Indicate the predominate range of cloud base temperatures;

(c) Indicate the predominate range of cloud top temperatures;

(d) What are the characteristics that distinguish days or clouds that are treated from those that are not treated?

ITEM 11 - This question relates to the evaluation of the effectiveness of the project. More information on the means used to judge the merit of the project are welcomed and can be described under Item 14 or on a separate page.

ITEM 12 - This question relates to any analysis that has been made to predict and/or measure the total change in the environment that is affected by the activity and, separately, the economic benefits expected or achieved.

ITEM 13 - Please supply the name and address of agency to which any request for further information should be directed.

ITEM 14 - This item is to permit the reporting person to include any information not covered by items 1 through 13 but which he feels is significant or of interest such as references to published reports describing results of the weather modification operation or experiment. Any information not previously reported, definite plans for a new project, information that is sought, etc., may be outlined under Item 14.

ITEM 15 - Please supply the name and address of the agency that is transmitting this information to WMO.

O R G A N I S A T I O N M E T E O R O L O G I Q U E M O N D I A L E

R/CLA/4, ANNEXE A
FORM (1er JANVIER 1988)

PROGRAMME DE RECHERCHE SUR LA PHYSIQUE DES NUAGES ET LA MODIFICATION ARTIFICIELLE DU TEMPS

QUESTIONNAIRE A REMPLIR
AFIN DE FOURNIR DES DONNEES POUR
L'INVENTAIRE 1988 DES PROJETS NATIONAUX DE MODIFICATION ARTIFICIELLE DU TEMPS

COCHER LA CASE CORRESPONDANTE

MEMBRE DE L'OMM .....

Le Membre n'a pas déployé d'activité de modification artificielle du temps en 1988 ..... /__/

(Veuillez renvoyer ce formulaire, même si aucune activité de modification artificielle du temps n'a eu lieu cette année)

1. TYPE (OBJECTIF) D'ACTIVITE OU DE PROJET DE MODIFICATION ARTIFICIELLE DU TEMPS :

(a) Augmentation des précipitations ..... /__/

Activité déployée à la suite d'une situation d'exception (par exemple, sécheresse) ..... /__/

Activité déployée en prévision d'une augmentation régulière de l'approvisionnement en eau ..... /__/

Il s'agit de prolonger la période humide ..... /__/

Il s'agit d'augmenter les précipitations pendant la période humide ..... /__/

(b) Redistribution des précipitations ..... /__/

(c) Suppression de la grêle ..... /__/

(d) Dispersion du brouillard ..... /__/

(e) Divers (veuillez préciser) .....

ANNEXE A, p. 2

2. IL S'AGIT PRINCIPALEMENT D'UNE ACTIVITE

(de recherche ..... /__/
(de développement .. /__/
(d'exploitation .... /__/

3. ZONE COUVERTE PAR LE PROJET

(a) Superficie approximative de la zone cible du projet (km^2) : ....

(b) Superficie approximative de la zone témoin (le cas échéant) (km^2) : .....

4. TITRE ET/OU NUMERO DE REFERENCE DU PROJET : .....

.....

5. REPERAGE DE LA ZONE DANS LAQUELLE LE PROJET EST EXECUTE : .....

.....

6. HISTORIQUE DU PROJET

(a) Année durant laquelle le projet a été entrepris : .....

(b) Les activités d'exécution du projet ont-elles eu lieu chaque année depuis le début des travaux ?

Oui /__/ Non /__/ Indéterminé /__/

(c) Est-il prévu de poursuivre le projet au cours de l'année prochaine ?

Oui /__/ Non /__/ Indéterminé /__/

7. CARACTERE DE L'ORGANISME QUI PATRONNE LE PROJET (veuillez cocher la case appropriée) :

ACTIVITE DE L'ORGANISME	ORGANISME GOUVERNEMENTAL	ORGANISME PRIVE
Agriculture		
Energie		
Sylviculture		
Hydrologie		
Fondation de recherche		
Transports		
Service météorologique		
Divers (veuillez préciser)		

8. ACTIVITES RELATIVES AU PROJET EN 1988

(a) Quels sont les mois de l'année considérée pendant lesquels ont eu lieu des opérations d'ensemencement ou d'autres activités de modification artificielle du temps ?

.....

.....

(Note : Si la période considérée porte sur deux ans, comme ce pourrait être le cas pour un projet s'étendant sur les mois de décembre et de janvier, veuillez indiquer les années faisant l'objet du rapport; exemples possibles : décembre 1987, janvier-février 1988, ou janvier-février 1988, décembre 1988).

(b) Nombre de jours de l'année durant lesquels ont eu lieu ces activités ?

.....

ANNEXE A, p. 4

9. DESCRIPTION DES APPAREILS UTILISES POUR LA MODIFICATION DU TEMPS, DES AGENTS DE MODIFICATION ET DE LEUR VITESSE DE DISPERSION, DES METHODES EMPLOYEES, ETC. (voir les instructions)

(a) Système de dispersion de la substance d'ensemencement :

Au sol	/__/	Nombre de générateurs	/__/
Aéronef	/__/	Nombre d'appareils	/__/
Fusées	/__/	Projectiles d'artillerie	/__/

Divers (veuillez préciser) .....

(b) Type de générateur :

Brûleur à acétone	/__/	Fusée pyrotechnique	/__/
Explosif	/__/	Vaporisation de liquide	/__/
Dispersion de solide	/__/	Divers	

(c) Lieu de dispersion de la substance d'ensemencement :

Au sol	/__/	A la base du nuage	/__/
Au sommet du nuage	/__/	Dans le nuage	/__/

Si la dispersion est effectuée dans le nuage, à quelle température ou en fonction de quel autre critère ?

.....

.....

SUBSTANCE D'ENSEMENCEMENT	VITESSE DE CONSOMMATION (indiquer les unités)	CONSOMMATION TOTALE DURANT L'ANNEE (kg)
AgI	.....	.....
PbI_2	.....	.....
Neige carbonique	.....	.....
NaCl	.....	.....
Propane	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

10. CARACTERISTIQUES DES NUAGES ENSEMENCES :

(a) Convectifs (cumulus) /__/ Orographiques /__/ Couche (stratiforme) /__/

(b) En règle générale, les températures à la base des nuages (°C) sont :

supérieures à +10°C /__/ inférieures à +10°C /__/

(c) En règle générale, les températures au sommet des nuages sont :

supérieures à 0°C /__/

inférieures à 0°C mais supérieures à -20°C /__/

inférieures à -20°C /__/

(d) Critères de sélection des jours d'ensemencement ou des nuages ensemencés :

.....

.....

.....

11. DISPOSITIONS PRISES EN VUE D'UNE EVALUATION

(a) Aucune /__/

(b) Expérience aléatoire /__/

(c) Comparaison avec des relevés anciens /__/

(d) Dégâts aux récoltes /__/ Coussins à grêle /__/

(e) Divers : .....

(f) Existe-t-il ou est-il prévu d'élaborer un document sur l'évaluation de l'activité ? Oui /__/ Non /__/

(g) Le cas échéant, est-il possible de le mettre à la disposition de l'OMM ? Oui /__/ Non /__/

12. DIVERS

(a) Une étude concernant les effets de ce projet sur l'environnement a-t-elle été préparée ? Oui /__/ Non /__/

ANNEXE A, p. 6

(b) Les coûts et les avantages escomptés (ou réels) ont-ils été analysés ? Oui /__/ Non /__/

13. ORGANISME RESPONSABLE DU PROJET :

(a) Nom du responsable technique : .....

(b) Organisme : .....

(c) Adresse : .....

.....

.....

14. REMARQUES FACULTATIVES :

.....

.....

.....

15. ORGANISME QUI FOURNIT LES RENSEIGNEMENTS

(a) Nom de l'organisme : .....

(b) Titre officiel du bureau responsable : .....

.....

(c) Adresse : .....

.....

.....

....
(Signature) (Date)

Veuillez remplir ce questionnaire et le renvoyer dès que possible, et dans tous les cas avant le 31 août 1989, à l'adresse suivante :

Monsieur le Secrétaire général
Organisation météorologique mondiale
41, Avenue Giuseppe-Motta
Case postale 2300
1211 GENEVE 2
Suisse

NOTES EXPLICATIVES POUR REMPLIR LE QUESTIONNAIRE SUR LES ACTIVITES DE MODIFICATION ARTIFICIELLE DU TEMPS

Activités de modification artificielle du temps qui devraient figurer dans l'inventaire

L'ensemencement ou la dispersion dans les nuages ou dans le brouillard de toute substance visant à modifier la distribution de la dimension des gouttes, à produire des cristaux de glace ou à coaguler les gouttelettes, à modifier l'évolution de la grêle ou de la foudre ou à influencer d'une manière ou d'une autre le cycle naturel de l'évolution des nuages ou leur environnement.

Toute autre activité déployée dans l'intention de produire des modifications artificielles de la composition, du comportement ou de la dynamique de l'atmosphère.

Par exemple :

(a) L'utilisation de feux ou de sources de chaleur pour influencer la circulation convective ou pour évaporer le brouillard.

(b) La modification du bilan du rayonnement solaire de la Terre et des nuages par la libération, dans l'atmosphère, de gaz, de poussières, de liquides ou d'aérosols.

(c) La modification des caractéristiques des surfaces terrestres ou aquatiques par poudrage ou par des traitements ayant recours à des poudres, des arrosages, des colorants ou d'autres substances.

(d) La libération dans l'atmosphère de particules radioactives ou électriquement chargées ou bien d'ions.

(e) L'application à l'atmosphère d'ondes de choc, de sources d'énergie acoustique ou d'autres sources explosives ou acoustiques.

(f) L'utilisation du souffle des aéronefs et des hélicoptères pour dissiper le brouillard, ainsi que l'utilisation de réacteurs et d'autres sources de vent artificiel.

(g) L'utilisation de laser ou d'autres sources de rayonnement électromagnétique.

ANNEXE A, p. 8

Activités de modification artificielle du temps qu'il n'est pas nécessaire d'inclure dans l'inventaire

Activités de caractère purement local, par exemple, l'utilisation de parafoudres et de dispositifs de décharge statique sur des aéronefs, des bateaux ou des bâtiments, ou bien l'utilisation de petites sources de chaleur, de ventilateurs, de dispositifs fumigènes, de souffles d'aéronefs ou d'arrosages pour éviter les gelées dans les régions ou les champs plantés de cultures que le gel risque d'endommager.

Note : Il convient de fournir un exemplaire dûment rempli de de formulaire pour chaque activité de modification artificielle du temps (dénommée ci-après le projet)

EXPLICATIONS COMPLEMENTAIRES
CONCERNANT LE QUESTIONNAIRE A REMPLIR POUR
L'INVENTAIRE DES PROJETS NATIONAUX DE MODIFICATION ARTIFICIELLE DU TEMPS

QUESTION 1 - Marquer d'une croix (x) la case qui correspond à l'objectif de l'activité. Par projet on entend une suite d'activités de modification du temps ayant un objectif commun et se déroulant à un endroit donné.

QUESTION 2 - Marquer d'une croix (x) la case correspondant au but de l'activité :

- o recherche - portant sur des questions scientifiques;
- o développement - activités pratiques déployées à des fins d'optimisation des procédures;
- o exploitation - activités pratiques directement axées sur des avantages économiques.

QUESTION 3 - La zone cible est la zone dans laquelle on cherche à obtenir une réaction. La ou les zones témoins sont choisies de manière à ne pas être touchées par la substance d'ensemencement et utilisées pour évaluer les résultats obtenus dans la zone cible.

QUESTION 4 - Inscrire le titre et/ou le numéro de référence du projet utilisé par l'exécutant. Si le projet a été mentionné dans l'inventaire précédent, veuillez indiquer le numéro d'inventaire de l'OMM qui figure dans la colonne 1.

QUESTION 5 - Repérer l'emplacement où est exécuté le projet de modification du temps en indiquant les coordonnées géographiques et le nom de la région.

QUESTION 6 - (a) Indiquer l'année au cours de laquelle ont été déployées les premières activités du projet;

(b) Indiquer si les activités ont subi des interruptions ou si elles ont eu lieu chaque année depuis le début du projet;

(c) Indiquer s'il est prévu de poursuivre le projet en marquant une croix (x) dans la case appropriée.

QUESTION 7 - Indiquer les principales activités de l'organisme qui finance le projet en marquant une croix (x) dans la case appropriée (marquer plusieurs croix, le cas échéant).

ANNEXE A, p. 10

QUESTION 8 - Indiquer les mois de l'année pendant lesquels les activités ont été déployées sur le terrain dans le cadre du projet et le nombre de jours d'activité. Tout autre renseignement sur le champ d'application de l'activité serait utile. Dans certains cas, le projet peut s'étendre sur deux ans. Il est souhaitable que seule la partie du projet exécutée pendant l'année considérée figure dans l'inventaire pour l'année en question. Si cela n'était pas possible, veuillez préciser les années pendant lesquelles les activités ont été déployées (par exemple, décembre 1986, janvier-février 1987).

QUESTION 9 - L'expression "appareil utilisé pour la modification artificielle du temps" désigne ici tout appareil utilisé dans l'intention de produire des modifications artificielles de la composition du comportement ou de la dynamique de l'atmosphère. Par exemple, générateurs de fumées d'AgI, dispositifs à propane, torches, fusées, projectiles d'artillerie, moteurs à réaction, etc.

(a) Système de dispersion de la substance d'ensemencement. Indiquer en marquant une croix (x) dans la case appropriée, la nature du système de dispersion au sol ou aéroporté, etc.

(b) Indiquer comment la substance d'ensemencement est préparée en vue de sa dispersion (par exemple, par combustion d'une solution d'iodure d'argent dans l'acétone). Par dispersion solide, on entend le dégagement de granulés (par exemple de neige carbonique), de poudre (par exemple de NaCl), etc.

(c) Indiquer le lieu de dispersion de la substance d'ensemencement.

(d) Indiquer la substance d'ensemencement qui est utilisée et la vitesse de dispersion (masse par unité de temps, masse par nuage, etc.). Indiquer, en kilogrammes, la quantité totale de substance dispersée durant toute la période à l'étude.

QUESTION 10 - (a) Indiquer, en marquant une croix (x) dans la case appropriée les caractéristiques générales des nuages qui ont été choisis pour traitement.

(b) Indiquer l'intervalle prédominant de températures à la base des nuages.

(c) Indiquer l'intervalle prédominant de températures au sommet des nuages.

(d) Quelles sont les caractéristiques qui permettent de distinguer les jours d'ensemencement ou les nuages ensemencés des autres ?

QUESTION 11 - Cette question se rapporte à l'évaluation de l'efficacité du projet. Il sera fait grand cas de tous les renseignements portant sur les moyens utilisés pour juger les avantages et les inconvénients du projet qui pourraient être donnés en liaison avec la question 14 ou sur une feuille distincte.

QUESTION 12 - Cette question se rapporte à toute analyse effectuée pour prévoir et/ou mesurer l'ensemble des modifications subies par l'environnement du fait de cette activité, ainsi que toute analyse distincte concernant les avantages économiques escomptés ou obtenus.

QUESTION 13 - Veuillez indiquer le nom et l'adresse de l'organisme auquel il faut adresser toute demande de renseignements complémentaires.

QUESTION 14 - Cette question doit permettre à la personne qui remplit le questionnaire de fournir tous les renseignements qui ne sont pas couverts par les questions 1 à 13 comprise et qu'elle juge significatifs ou intéressants, notamment les références à des publications sur les résultats de l'opération ou de l'expérience de modification artificielle du temps. Tout renseignement qui ne figure pas dans les questions qui précèdent, plans définitifs concernant un nouveau projet, renseignement recherché, etc. peut être exposé en liaison avec la question 14.

QUESTION 15 - Veuillez indiquer le nom et l'adresse de l'organisme qui fournit ces renseignements à l'OMM.

ВСЕМИРНАЯ МЕТЕОРОЛОГИЧЕСКАЯ ОРГАНИЗАЦИЯ

R/CLA/4, ПРИЛОЖЕНИЕ A
ФОРМА (1 ЯНВАРЯ 1988 г.)

ПРОГРАММА НАУЧНЫХ ИССЛЕДОВАНИЙ ПО ФИЗИКЕ ОБЛАКОВ И АКТИВНЫМ ВОЗДЕЙСТВИЯМ НА ПОГОДУ

ВОПРОСНИК
ПО СБОРУ ДАННЫХ ДЛЯ РЕЕСТРА ПРОЕКТОВ ПО АКТИВНЫМ ВОЗДЕЙСТВИЯМ НА ПОГОДУ - 1988 г.

ПРОСЬБА ЗАПОЛНИТЬ СООТВЕТСТВУЮЩИЕ КВАДРАТЫ

ЧЛЕН ВМО .....

Деятельность по активному воздействию на погоду не проводилась в 1988 г. ▱

(Просьба прислать эту форму, даже если деятельность по активному воздействию на погоду в этом году не проводилась).

1. ВИД (ЦЕЛЬ) ДЕЯТЕЛЬНОСТИ ИЛИ ПРОЕКТА ПО АКТИВНЫМ ВОЗДЕЙСТВИЯМ НА ПОГОДУ:

a) Увеличение осадков ..... ▱

Деятельность вызвана чрезвычайными обстоятельствами (например, засухи) ..... ▱

Деятельность осуществляется в целях обычного увеличения водоснабжения ..... ▱

С целью продления влажного периода ..... ▱

С целью увеличения осадков в течение влажного периода ..... ▱

b) Перераспределение осадков ..... ▱

ПРИЛОЖЕНИЕ А, стр. 2

c) Предотвращение града ..... ▱

d) Рассеивание тумана ..... ▱

e) Другие виды (просьба указать) .....

2. ЭТА ДЕЯТЕЛЬНОСТЬ НОСИТ, ГЛАВНЫМ ОБРАЗОМ, ХАРАКТЕР

(исследований ..... ▱)
( )
(развития ..... ▱)
( )
(оперативного)
(свойства ..... ▱)

3. РАЙОН ПРОЕКТА

a) Приблизительный размер района цели проекта ($км^2$): .....

b) Приблизительный размер контрольного района (если используется) ($км^2$): .....

4. НАЗВАНИЕ И/ИЛИ ОБОЗНАЧЕНИЕ ПРОЕКТА: .....

.....

5. МЕСТОНАХОЖДЕНИЕ РАЙОНА, ГДЕ ОСУЩЕСТВЛЯЕТСЯ ПРОЕКТ:

.....

6. ИСТОРИЯ ПРОЕКТА

a) Год начала проекта: .....

b) Осуществлялся ли проект каждый год после его начала?

Да ▱ Нет ▱ Неизвестно ▱

c) Предполагается ли продолжение проекта в течение следующего года?

Да ▱ Нет ▱ Неизвестно ▱

7. ХАРАКТЕР ОРГАНИЗАЦИИ, ЗАКАЗАВШЕЙ ПРОЕКТ
(просьба поставить X в соответствующем месте)

ДЕЯТЕЛЬНОСТЬ ОРГАНИЗАЦИИ	ПРАВИТЕЛЬСТВЕННАЯ	ЧАСТНАЯ
Сельское хозяйство		
Энергетика		
Лесное хозяйство		
Гидрология		
Научно-исследовательская		
Транспорт		
Служба погоды		
Прочие (просьба указать)		

8. ДЕЯТЕЛЬНОСТЬ ПО ПРОЕКТУ В ЭТОМ ГОДУ

a) В какие месяцы текущего отчетного года производился засев или проводилась другая деятельность по активному воздействию на погоду?

.....

ПРИЛОЖЕНИЕ А, стр. 4

(Примечание. Если отчетный период охватывает два года, например, при сообщении информации о проекте, осуществляемом в течение декабря и января, то просьба указать годы. Пример: декабрь 1987 г., январь-февраль 1988 г.; другой пример: январь-февраль 1988 г., декабрь 1988 г.).

b) Сколько дней проводилась эта деятельность? .....

9. ОПИСАНИЕ УСТРОЙСТВА АКТИВНОГО ВОЗДЕЙСТВИЯ НА ПОГОДУ, РЕАГЕНТОВ АКТИВНОГО ВОЗДЕЙСТВИЯ И СКОРОСТИ ИХ РАСПЫЛЕНИЯ, ИСПОЛЬЗУЕМЫХ МЕТОДОВ И Т.Д. (см. указания)

a) Система доставки материала для засева:

Наземная ▱ ..... Сколько генераторов? ▱

Самолет ▱ ..... Сколько самолетов? ▱

Ракеты ▱ Артиллерийские снаряды ▱

Прочая (просьба указать).....

b) Тип генератора:

Ацетоновая горелка ▱ Пиротехническая ракета ▱

Взрывчатое вещество ▱ Разбрызгиватель жидкости ▱

Распылитель твердых частиц ▱ Прочее: .....

c) Расположение выпуска засеивающего вещества:

Наземное ▱ Нижняя граница облаков ▱

Верхняя граница облаков ▱ В облаках ▱

Если выпуск осуществляется в облаке, то при какой температуре или другом критерии?

.....

.....

Реагент засева	Расход (указать единицы измерения)	Общий расход в течение года (в кг)
AgI	.....	.....
PbI_2	.....	.....
Сухой лед	.....	.....
NaCl	.....	.....
Пропан	.....	.....
.....		
.....		
.....		

10. ХАРАКТЕРИСТИКИ ОБРАБАТЫВАЕМЫХ ОБЛАКОВ:

a) Конвективные (кучевые) ▱ Орографические ▱ Слой (слоистообразные) ▱

b) Преобладающая температура в нижней части облака (C^0):

Выше +10°C ▱ Ниже +10°C ▱

c) Преобладающая температура в верхней части облака:

Выше 0°C ▱

Ниже 0°C, но выше -20°C ▱

Ниже -20°C ▱

d) Критерии, используемые при выборе дней или облаков для работы:

.....

.....

.....

ПРИЛОЖЕНИЕ А, стр. 6

11. ОБОСНОВАНИЯ ДЛЯ ОЦЕНКИ

a) Не имеется ▱

b) Рандомизированный эксперимент ▱

c) Сравнение с историческими данными ▱

d) Ущерб урожаю ▱ Градомеры ▱

e) Прочие: .....

f) Имеется ли документ по оценке или планируется таковой? ДА ▱ НЕТ ▱

g) Если да, то можно ли его направить в ВМО? ДА ▱ НЕТ ▱

12. РАЗНОЕ

a) Была ли подготовлена для этого проекта оценка влияния на окружающую среду? ДА ▱ НЕТ ▱

b) Проведен ли анализ предполагаемых (или фактических) затрат и выгод? ДА ▱ НЕТ ▱

13. НАЗВАНИЕ ОРГАНИЗАЦИИ, ОТВЕТСТВЕННОЙ ЗА ПРОЕКТ:

a) Фамилия главного технического лица: .....

b) Организация: .....

c) Почтовый адрес: .....

.....

.....

14. ЛЮБЫЕ ЗАМЕЧАНИЯ:

.....

.....

.....

.....

15. ОРГАНИЗАЦИЯ, НАПРАВЛЯЮЩАЯ ОТЧЕТ:

a) Название организации, направляющей отчет: .....

b) Официальное название ответственного подразделения: .....

.....

c) Почтовый адрес: .....

.....

.....

.....

.....

....

(Подпись) (Дата)

Просьба заполнить и вернуть этот вопросник по возможности скорее и в любом случае не позднее 31 августа 1989 г. по адресу:

The Secretary-General
World Meteorological Organization
41, Avenue Giuseppe-Motta
Case postale 2300
1211 GENEVA 2
Switzerland

ПРИЛОЖЕНИЕ A, стр. 8

ПРИМЕЧАНИЯ ПО СОСТАВЛЕНИЮ ОТЧЕТА О ДЕЯТЕЛЬНОСТИ ПО АКТИВНЫМ ВОЗДЕЙСТВИЯМ НА ПОГОДУ

Деятельность по активным воздействиям на погоду, которую следует включить в Реестр

Засеивание или распространение в облачности или тумане какого-либо вещества с целью изменения распределения размера капель, образования кристаллов льда или коагуляции капелек, изменение развития града или молний или осуществление какого-либо воздействия на естественное развитие цикла облаков или их окружение.

Любая другая деятельность, осуществляемая с целью вызывания искусственных изменений в составе, поведении или динамике атмосферы.

Например:

a) использование огня или источников тепла для оказания влияния на конвективную циркуляцию или для испарения тумана;

b) активное воздействие на обмен солнечной радиации земли или облаков посредством выделения в атмосферу газов, пыли, жидкостей или аэрозолей;

c) активное воздействие на характеристики поверхностей земли или воды при помощи опыления или обработки порошками, жидкими распылителями, красителями или другими веществами;

d) выделение в атмосферу электрически заряженных или радиоактивных частиц, или ионов;

e) применение в атмосфере ударных волн, источников звуковой энергии или других взрывных или акустических источников;

f) использование самолетов и вертолетов для создания нисходящих потоков в целях рассеивания тумана, а также использование реактивных двигателей и других источников создания искусственного ветра;

g) использование лазеров или других источников электромагнитной радиации.

Деятельность по активным воздействиям на погоду, которую не следует включать в Реестр

Деятельность, носящую чисто локальный характер, такую, как использование отражателей молний или статистических разрядников на самолетах, судах или зданиях или использование небольших источников тепла, вентиляторов, противотуманных устройств, создание нисходящего воздушного потока воздушными судами или распылителями для предотвращения заморозков на участках или полях с посевом культур, которым наносят ущерб заморозки или морозы.

Примечание. Просьба заполнить один экземпляр этой формы для каждого вида деятельности по активным воздействиям на погоду (в дальнейшем именуемого как проект).

ПРИЛОЖЕНИЕ А, стр. 10

ДОПОЛНИТЕЛЬНЫЕ ПОЯСНЕНИЯ К ВОПРОСАМ ДЛЯ РЕЕСТРА НАЦИОНАЛЬНЫХ ПРОЕКТОВ ПО АКТИВНЫМ ВОЗДЕЙСТВИЯМ НА ПОГОДУ

ПУНКТ 1 - Укажите значком (X) ячейку, которая соответствует целям деятельности. Под проектом подразумевается связанная серия действий по активным воздействиям на погоду, имеющих общую цель и проводимых в конкретном месте.

ПУНКТ 2 - Укажите значком (X) ячейку, соответствующую цели деятельности:

- исследовательская	- вопросы научных исследований;
- развитие	- полевая работа по оптимизации процедур;
- оперативная	- полевая работа, направленная непосредственно на достижение экономических выгод.

ПУКНТ 3 - Под районом цели подразумевается район, в пределах которого предполагается обнаружить последствия деятельности по активному воздействию на погоду. Под контрольным районом (или районами) понимаются районы, которые выбраны так, чтобы они не подвергались воздействиям засевающих веществ; они используются для оценки результатов в пределах района цели.

ПУНКТ 4 - Впишите название и/или обозначение проектов, используемых оператором. Если проект был зарегистрирован в предыдущем Реестре, просьба указать номер Реестра ВМО, который стоит в колонке 1.

ПУНКТ 5 - С помощью географических координат и названия районов укажите место осуществления проекта по активным воздействиям на погоду.

ПУНКТ 6 - а) Укажите год осуществления первоначальной деятельности по настоящему проекту;

b) Укажите, были ли перерывы в деятельности или же она проводилась каждый год со времени начала;

c) Укажите, предполагается ли продолжить проект в будущем, поставив значок (X) в соответствующей ячейке.

ПУНКТ 7 - Укажите основной род занятий организации, которая финансирует проект, обозначив значком (X) соответствующую ячейку (при необходимости используйте несколько значков).

ПУНКТ 8 - В какие месяцы и сколько дней осуществлялась оперативная полевая фаза проекта? Была бы полезна любая информация, касающаяся целей деятельности. В некоторых случаях проекты охватывают два года. Желательно включить в Реестр за конкретный год только ту часть, которая проводилась в отчетный период. Если это невозможно, просьба указать годы, в которые проводилась деятельность, например, декабрь 1987 г., январь-февраль 1988 г.

ПУНКТ 9 - Под устройством активного воздействия на погоду подразумеваются любые устройства, используемые с целью намеренного вызывания искусственных изменений в составе, поведении или динамике атмосферы. Например: генераторы засеивания йодистым серебром, пропановые устройства, пиротехнические устройства, ракеты, артиллерийские снаряды, реактивных двигатели и т.д.

a) Система доставки засеивающих веществ. Укажите, обозначив значком (X) соответствующую ячейку, характер системы доставки - наземная, воздушная и т.д.;

b) Укажите способ подготовки засеивающего вещества для распыления (например, путем сжигания ацетонового раствора соединения йодистого серебра). Распыление твердых частиц относится к рассеиванию ледяных крупинок (например, сухой лед), порошка (например, NaCl) и т.д.;

c) Укажите, обозначив значком (X), соответствующую ячейку, место рассеивания засеивающего реагента;

ПРИЛОЖЕНИЕ А, стр. 12

d) Укажите, какие засеивающие реагенты используются и какова скорость рассеивания (масса на единицу времени, масса на облако и т.д.). Укажите, в килограммах, общее количество реагента, рассеянного в течение отчетного периода.

ПУНКТ 10 - a) Укажите, обозначив значком (X), ячейку, общую характеристику облаков, которые выбраны для обработки;

b) Укажите преобладающий диапазон температур на нижней границе облака;

c) Укажите преобладающий диапазон температур на верхней границе облака;

d) По каким характеристикам отличают дни или облака, подвергнутые воздействию, от тех, которые не были подвергнуты воздействию?

ПУНКТ 11 - Этот вопрос относится к оценке эффективности проекта. Предоставление большего объема информации по средствам, используемым для оценки положительных сторон проекта, только приветствуется, и эта информация может быть представлена под пунктом 14 или на отдельной странице.

ПУНКТ 12 - Этот вопрос относится к любому анализу, проведенному с целью расчета и/или измерения общего изменения окружающей среды, подвергнутой воздействию, и отдельный вопрос касается предполагаемых или полученных экономических выгод.

ПУНКТ 13 - Сообщите название и адрес организации, в которую можно направлять запросы о последующей информации.

ПУНКТ 14 - Этот пункт позволит лицу, представляющему отчет, включить любую информацию, которая не вошла в пункты с 1 по 13, но которую он считает важной или представляющей интерес, такую, например, как ссылка на опубликованные отчеты, представляющие результаты осуществления активного воздействия на погоду или эксперимента. Любая не сообщавшаяся ранее информация, определенные планы на новый проект, поиск информации и т.д. могут быть отражены под пунктом 14.

ПУНКТ 15 - Просьба сообщить название и адрес учреждения, которое передает эту информацию ВМО.

O R G A N I Z A C I O N M E T E O R O L O G I C A M U N D I A L

R/CLA/4, ANEXO A
FORMULARIO (1 DE ENERO DE 1988)

PROGRAMA DE INVESTIGACION SOBRE LA FISICA DE NUBES
Y LA MODIFICACION ARTIFICIAL DEL TIEMPO

CUESTIONARIO
PARA RECOPILAR DATOS DESTINADOS AL INVENTARIO DE 1988 DE PROYECTOS NACIONALES DE MODIFICACION ARTIFICIAL DEL TIEMPO

SEÑALAR EN LA CASILLA CORRESPONDIENTE

MIEMBRO DE LA OMM .....

El Miembro no ha llevado a cabo actividades de modificación en 1988 /__/

(Sírvase devolver este formulario aunque no se haya llevado a cabo ninguna actividad de modificación artificial del tiempo este año.)

1. TIPO (FINALIDAD) DE LA ACTIVIDAD O DEL PROYECTO DE MODIFICACION ARTIFICIAL DEL TIEMPO:

a) Intensificación de la precipitación ..... /__/

Esta actividad es la respuesta a una situación de urgencia (por ejemplo sequías) ..... /__/

Esta actividad tiene por objeto lograr un aumento del abastecimiento normal de agua ..... /__/

Se trata de prolongar el período húmedo ..... /__/

Se trata de aumentar la precipitación durante el período húmedo ..... /__/

b) Redistribución de la precipitación ..... /__/

c) Supresión del granizo ..... /__/

d) Dispersión de la niebla ..... /__/

e) Otros (especifíquense): .....

ANEXO A, p. 2

2. SE TRATA PRINCIPALMENTE DE UNA ACTIVIDAD

(de investigación .... /__/
(de desarrollo ..... /__/
(operativa ..... /__/

3. ZONA QUE CUBRE EL PROYECTO

a) Superficie aproximada de la zona del blanco (km^2): .....

b) Superficie aproximada de la zona de control (si procede) (km^2): .....

4. NOMBRE Y/O REFERENCIA DEL PROYECTO: .....

.....

5. SITUACION DE LA ZONA EN LA QUE SE EJECUTA EL PROYECTO:

.....

6. HISTORIAL DEL PROYECTO

a) Año del comienzo del proyecto: .....

b) Indique si el proyecto se ha realizado cada año desde el principio de los trabajos

Sí /__/ No /__/ No se sabe /__/

c) ¿Se ha previsto que continúe el proyecto durante el año próximo?

Sí /__/ No /__/ No se sabe /__/

7. NATURALEZA DE LA ORGANIZACION QUE PATROCINA EL PROYECTO (colóquese una X en la casilla que corresponda)

ACTIVIDAD DE LA ORGANIZACION	GUBERNAMENTAL	PRIVADA
Agricultura		
Energía		
Silvicultura		
Hidrología		
Fundación de investigación		
Transporte		
Servicio Meteorológico		
Otras actividades (especifíquense)		

8. ACTIVIDADES RELATIVAS AL PROYECTO EN 1986

a) ¿Cuáles son los meses del año durante los cuales se han realizado operaciones de siembra u otras actividades de modificación artificial del tiempo?

.....

(Nota: Si el período abarca más de dos años, como podría ocurrir si un proyecto se realiza durante los meses de diciembre y enero, sírvase indicar los años de que trata el informe; ejemplos posibles: diciembre de 1987, enero-febrero de 1988 o enero-febrero de 1988, diciembre de 1988).

b) Número de días durante los cuales se han llevado a cabo estas actividades .....

9. DESCRIPCION DE LOS APARATOS DE MODIFICACION ARTIFICIAL DEL TIEMPO, E INDICACION DE LOS AGENTES DE MODIFICACION Y SUS INDICES DE DISPERSION, TECNICAS EMPLEADAS, ETC. (véanse instrucciones)

a) Procedimiento de siembra:

Desde tierra /__/ ..... ¿Cuántos generadores? /__/

ANEXO A, p. 4

Desde aeronaves /__/ ..... ¿Cuántas aeronaves? /__/

Mediante cohetes /__/ Proyectiles de artillería /__/

Otros (especifíquense): .....

b) Tipo de generador:

Quemador de acetona /__/ Fulguración pirotécnica /__/

Explosivo /__/ Neutralizador líquido /__/

Dispersión de sustancias sólidas /__/ Otros: .....

c) Lugar de lanzamiento del material de siembra:

En tierra /__/ Base de las nubes /__/

Cima de las nubes /__/ Interior de las nubes /__/

Si el lanzamiento se hace en el interior de una nube, ¿a que temperatura o cuál criterio?

.....

.....

Material de siembra	Cantidad de material consumido (dar unidades)	Consumo total durante este año (kg)
AgI	.....	.....
PbI_2	.....	.....
Hielo Seco	.....	.....
NaCl	.....	.....
Propano	.....	.....
.....		
.....		
.....		

10. CARACTERISTICAS DE LAS NUBES TRATADAS:

a) Convectivas (cúmulos) /__/ Orográficas /__/ Capa de nubes (estratiforme) /__/

b) En general las temperaturas de la base de las nubes (°C) son:

Superiores a +10°C /__/ Inferiores a +10°C /__/

c) En general, las temperaturas en la cima de las nubes son:

Superiores a 0°C /__/

Inferiores a 0°C pero superiores a -20°C /__/

Inferiores a -20°C /__/

d) Criterios de selección de los días de siembra o de las nubes sembradas:

.....

.....

.....

11. DISPOSICIONES QUE SE HAN TOMADO PARA REALIZAR LA EVALUACION

a) Ninguna /__/

b) Experimento aleatorio /__/

c) Comparación con registros históricos /__/

d) Daños causados a las cosechas /__/ Paquetes de granizo /__/

e) Demás: .....

f) Indíque si existe o si se ha previsto preparar un documento sobre la evaluación de la actividad SI /__/ NO /__/

g) Si procede indíque si es posible facilitarlo a la OMM SI /__/ NO /__/

12. DIVERSOS

a) Indique si se ha preparado un estudio sobre los efectos de este proyecto para el medio ambiente SI /__/ NO /__/

ANEXO A, p. 6

b) Indique si se han analizado los costos y las ventajas previstos SI /__/ NO /__/

13. ORGANIZACION ENCARGADA DEL PROYECTO

a) Nombre de la persona encargada de los aspectos técnicos .....

.....

b) organización .....

c) dirección .....

.....

.....

14. DEMAS OBSERVACIONES:

.....

.....

.....

.....

15. ORGANISMO QUE PRESENTA LA INFORMACION:

a) Nombre del organismo:.....

b) Título oficial de la dependencia responsable: .....

.....

c) Dirección: .....

.....

.....

.....

.....

....

(Firmado) (Fecha)

Sírvase rellenar el presente cuestionario y devolverlo lo antes posible, y en todo caso antes del 31 de agosto de 1989 a la dirección siguiente:

Señor Secretario General
Organización Meteorológica Mundial
41, Avenue Giuseppe-Motta
Case postale 2300
1211 GINEBRA 2
Suiza

ANEXO A, p. 8

NOTAS ACLARATORIAS PARA RELLENAR EL INFORME SOBRE ACTIVIDADES DE MODIFICACION ARTIFICIAL DEL TIEMPO

Actividades de modificación artificial del tiempo que deberán consignarse en el inventario

La siembra o dispersión, en las nubes o en la niebla, de cualquier sustancia inyectada con objeto de alterar la distribución de las dimensiones de las gotas, que produzcan cristales de hielo o la coagulación de gotas minúsculas, que altere el proceso de formación de granizo o de descargas eléctricas, o que incluya de un modo u otro en el desarrollo natural del ciclo de formación de nubes o en el medio que las rodea.

Cualquier otra actividad, realizada con intención de producir por medios artificiales cambios en la composición, el comportamiento o la dinámica de la atmósfera.

Por ejemplo:

a) la utilización de fuegos o de focos de calor con miras a influir en la circulación convectiva o a provocar la evaporación de la niebla;

b) la modificación del intercambio de la radiación solar de la tierra o de las nubes, mediante la emisión de gases, polvos, líquidos o aerosoles en la atmósfera;

c) la modificación de las características de las superficies terrestres o líquidas espolvoreándolas o tratándolas con sustancias pulverizadas, o con líquidos nebulizados, materias colorantes u otros materiales;

d) la emisión en la atmósfera de partículas cargadas eléctricamente o de partículas radiativas, o bien de iones;

e) la aplicación a la atmósfera de ondas de choque, fuentes de energía sónica u otras fuentes explosivas o acústicas;

f) la utilización de aviones y helicópteros para la dispersión de la niebla mediante la corriente de aire provocada por las palas o hélices de los mismos, así como la utilización de reactores y de otros generadores artificiales de viento;

g) la utilización de lasers u otras fuentes de radiación eletromagnética.

Actividades de modificación artificial del tiempo que no deberán consignarse en el inventario

Actividades de índole puramente local, tales como la utilización de pararrayos o dispositivos de descargas estáticas a bordo de los aviones, buques o edificios; o la utilización de pequeños focos caloríferos, de ventiladores, de generadores de humo; o el empleo de aeronaves con miras a aprovechar la corriente de aire provocada por las palas de los rotores o las hélices, o de riesgos para evitar la formación de hielo en zonas o terrenos en los que los cultivos son susceptibles de sufrir daños por causa de las heladas.

Nota: Se solicita el envío de un ejemplar rellenado de este formulario para cada actividad de modificación artificial de tiempo (en adelante denominado proyecto).

ANEXO A, p. 10

EXPLICACION ADICIONAL
DE LAS PREGUNTAS QUE FIGURAN EN EL FORMULARIO PARA EL
INVENTARIO DE PROYECTOS NACIONALES DE MODIFICACION ATIFICIAL DEL TIEMPO

PREGUNTA 1 - Escríbase una (X) en la casilla que corresponda a la finalidad de la actividad. Se entiende por proyecto una serie relacionada de actividades de modificación artificial del tiempo que tiene un objetivo común y que se realiza en un lugar determinado.

PREGUNTA 2 - Escríbase una (X) en la casilla correspondiente a la finalidad de la actividad:

- investigación - investigación de cuestiones científicas;
- desarrollo - trabajos sobre el terreno para optimizar los procedimientos
- operativa - trabajos sobre el terreno con la intención directa de obtener beneficios económicos.

PREGUNTA 3 - La zona del blanco es aquella en la que se trata de obtener un efecto. La zona (o zonas) de control es aquella que se escoge para que no sea afectada por el material de siembra y se utiliza para evaluar los resultados dentro de la zona del blanco.

PREGUNTA 4 - Consígnese el nombre y/o referencia de los proyectos que ejecuta el realizador. Si el proyecto fue comunicado ya en el inventario anterior, rogamos cite el número de inventario de la OMM que aparece en la columna 1.

PREGUNTA 5 - Indíquese el lugar donde se ejecuta el proyecto de modificación artificial del tiempo mediante coordenadas geográficas y el nombre de la región.

PREGUNTA 6 - a) Consígnese el año en que tuvieron lugar las primeras actividades en el marco del presente proyecto;

b) indíquese si se han interrumpido las actividades o si se han realizado cada año desde el principio del proyecto;

c) indíquese si está previsto que el proyecto continúe, señalando con una (X) la casilla adecuada.

PREGUNTA 7 - Indíquense los principales intereses de la organización que financia el proyecto, señalando con una (X) la casilla apropiada (utilícense varias señales si es necesario).

PREGUNTA 8 - Indíquense los meses del año durante los cuales se han realizado actividades sobre el terreno en el marco del proyecto y el número de días de actividad. Cualquier otra información sobre el campo de apliación de la actividad. Convendría que sólo se mencione en el inventario la parte del proyecto realizada durante el año de que se trata. Si esto no es posible, sírvase especificar los años durante los cuales se han realizado las actividades (por ejemplo: diciembre de 1987, enero-febrero de 1988).

PREGUNTA 9 - Se entiende por aparato para la modificación artificial del tiempo cualquier apartato utilizado con la intención de producir cambios artificiales en la composición, comportamiento o dinámica de la atmósfera. Por ejemplo, generadores de humo de AgI, dispositivos de propano, fulguraciones, cohetes, proyectiles de artillería, reactores, etc.

a) procedimiento de siembra, indíquese, señalando con una (X) la casilla adecuada, el carácter del sistema de emisión, con base en tierra, aerotransportado, etc.;

b) indíquese el modo en que se prepara el material de siembra para su dispersión (por ejemplo, quemando una solución de yoduro de plata en acetona). La dispersión de sustancias sólidas se refiere al lanzamiento de gránulos (por ejemplo, hielo seco), polvo (por ejemplo, NaCL), etc.;

c) indíquese el lugar en el que se dispersa el material de siembra;

d) indíquese qué material de siembra se utiliza y su índice de dispersión (masa por unidad de tiempo, masa por nube, etc.) Indíquese la cantidad total de material empleado durante el período de este informe en kilos.

PREGUNTA 10 a) Indíquese, señalando con una (X) la casilla adecuada, las caraterísticas generales de las nubes que se seleccionan para el tratamiento;

b) indíquese el intervalo predominante de las temperaturas en la base de las nubes;

c) indíquese el intervalo predominante de las temperaturas en la cima de las nubes;

d) ¿Cuáles son las características distintivas de las nubes en los días en que se han sometido a tratamiento y de las nubes no tratadas?

ANEXO A, p. 12

PREGUNTA 11 - Esta pregunta se refiere a la evaluación de la eficacia del proyecto. Se acogerá con satisfacción mayor información sobre los medios utilizados para juzgar los méritos del proyecto, y ello puede describirse bajo el punto 14 o en una página aparte.

PREGUNTA 12 - Esta pregunta se refiere a cualquier análisis realizado para prever y/o medir el conjunto de las modificaciones del medio ambiente como consecuencia de esta actividad así como a cualquier análisis sobre las ventajas económicas previstas o alcanzadas.

PREGUNTA 13 - Rogamos proporcione el nombre y dirección del organismo al que ha de dirigirse toda petición de mayor información.

PREGUNTA 14 - Esta pregunta tiene por finalidad permitir que la persona que presenta el informe incluya toda información no tratada por las preguntas 1 a 13 pero que estime importante o de interés, como pueden ser las referencias a informes publicados en los que se describen los resultados de la operación o experimento de modificación artificial del tiempo. Toda información no consignada anteriormente, planes concretos para un nuevo proyecto, información que se solicita, etc. puede exponerse en la pregunta 14.

PREGUNTA 15 - Rogamos proporcione el nombre y dirección del organismo que transmite esta información a la OMM.

APPENDIX B

COPY OF FORM FOR REPORT ON COMPLETED WEATHER MODIFICATION PROJECTS

W O R L D M E T E O R O L O G I C A L O R G A N I Z A T I O N

R/CLA/4, ANNEX B

REPORT ON COMPLETED WEATHER MODIFICATION PROJECT

(Please mark X in box or boxes which apply)

MEMBER OF WMO: .....

1. DESCRIPTION OF PROJECT

1.1 Project identification (name/location/organization): .....

.....

.....

.....

.....

.....

.....

1.2 Purpose(s) of project

Precipitation augmentation - rainfall /__/ snow /__/

Hail suppression /__/

Lightning suppression /__/

Other (please specify): .....

.....

1.3 Major cloud type involved:

Orographic /__/ Cumulus /__/ Stratiform /__/ Frontal /__/

2. DURATION OF PROJECT

2.1 Project duration in years: .....

2.2 Operational period within each year:

From: ..... To: ..... inclusive.

3. SEEDING OPERATION

3.1 Seeding agent: AgI /__/ CO_2 /__/ NaCl /__/

Other (please specify): .....

3.2 Generator(s): On ground /__/ Airborne /__/

If on ground, please give number of generators: .....

3.3 Procedure for airborne seeding:

Altitude of seeding (m): .....

Length of seeding track (m or km): .....

Seeding rate (Kg h^{-1}): .....

4. PROJECT DESIGN

4.1 Basic design:

Target only /__/ Target + control /__/ Cross-over /__/

4.2 Distance between areas (km): .....

4.3 Area definition:

Fixed /__/ Variable /__/

If variable, give basis for definition: .....

4.4 Area subdivisions, if any (give number and nature): .....

.....

5. PROJECT SITE

5.1 Project terrain:

Mountainous /__/ Hilly /__/ Flat /__/

5.2 Size of target area (km^2): .....

5.3 Size of control area (km^2): .....

5.4 Number of precipitation gauges:

5.4.1 All types of precipitation gauges in target area: .....

All types of precipitation gauges in control area: .....

5.4.2 Recording precipitation gauges in target area: .....

Recording precipitation gauges in control area: .....

5.5 Other verification quantities (e.g., radar reflectivity, aircraft cloud measurements, hailpads, etc.): .....

.....

6. EXPERIMENTAL UNIT

6.1 Duration of unit in hours or days: .....

6.2 Conditions determining whether unit is seedable or not: .....

.....

6.3 Total number of units seeded and not seeded (in case of cross-over design this applies to each area):

.....

6.4 Randomization of experimental units:

Unrestricted /__/ Restricted /__/

If restricted, give nature of restriction: .....

.....

6.5 Standard seeding period (hours): .....

7. OVERALL PROJECT RESULTS (no stratification or partitioning)

7.1 Name of statistical test(s) and/or analysis (analyses):

.....

7.2 Transformation(s) for each test: .....

7.3 Results for each test and/or analysis: .....

7.3.1 Qualitative:

No Difference	/__/	More Precipitation	/__/	Less Precipitation	/__/	Less Hail Mass	/__/

Other qualitative results: .....

.....

7.3.2 Quantitative:

Seed/no-seed ratio: ..... Statistical significance: .....

ANNEX B, p. 4

8. BASIS FOR ASSESSMENT OF RESULTS

8.1 Analytical specifications fixed BEFORE the project began

8.1.1 Nature of stratification(s), if any: .....

8.1.2 Sample size for each stratification (No. of seed/no-seed units):

Seed: ..... No seed: .....

8.1.3 Test(s) and/or analysis (analyses) for each stratification:

.....

8.1.4 Transformation(s) for each stratification and each test:

.....

8.1.5 Results for each stratification, test and transformation:

Qualitative: .....

Quantitative: .....

8.2 Analytical specifications chosen AFTER the project began

8.2.1 Nature of partitioning(s): .....

8.2.2 Sample size for each partition (No. of seed/no-seed units):

Seed: ..... No seed: .....

8.2.3 Test(s) and/or analysis (analyses) for each partition:

.....

8.2.4 Transformation(s) for each partition and each test:

.....

8.2.5 Results for each partition, test and transformation:

Qualitative: .....

Quantitative: .....

9. EXTENDED AREA EFFECTS (i.e., outside the target area)

9.1 Sign of effect: .....

9.2 Maximum distance observed: .....

9.3 Statistical significance (size of area and probability):

.....

10. COMMENTS

.....

.....

.....

.....

.....

11. PRINCIPAL REFERENCES TO PUBLISHED RESULTS (where details of above may be found):

.....

.....

.....

.....

.....

ORGANISATION METEOROLOGIQUE MONDIALE

R/CLA/4, ANNEXE B

RAPPORT SUR UN PROJET DE MODIFICATION ARTIFICIELLE DU TEMPS DEJA REALISE

[veuillez cocher (x) dans la ou les cases appropriées]

MEMBRE DE L'OMM : .....

1. DESCRIPTION DU PROJET

1.1 Identification du projet (titre/zone d'exécution/organisation)

.....

.....

.....

.....

.....

.....

1.2 But(s) du projet

Augmentation des précipitations Pluie /__/ Neige /__/

Suppression de la grêle /__/

Suppression de la foudre /__/

Autres modifications (veuillez préciser) : .....

.....

1.3 Principaux types de nuages traités :

Orographiques /__/ Cumulus /__/ Stratiformes /__/ Système frontal/__/

ANNEXE B, p. 2

2. DUREE DU PROJET

2.1 Durée du projet, en années : .....

2.2 Période opérationnelle au cours de chaque année :

du ..... au ..... (inclusivement)

3. OPERATIONS D'ENSEMENCEMENT

3.1 Agents d'ensemencement : AgI /__/ CO_2 /__/ NaCl /__/

Autres (veuillez préciser) : .....

3.2 Générateur(s) : Au sol /__/ Aéroporté(s) /__/

Dans le cas de générateurs au sol, veuillez indiquer le nombre de générateurs utilisés :

.....

3.3 Méthode d'ensemencement par appareil aéroporté

Altitude de l'ensemencement (m) .....

Longueur de la trajectoire suivie pour l'ensemencement (m ou km) .....

Taux d'ensemencement (Kg h^{-1}) .....

4. CONCEPTION DU PROJET

4.1 Conception de base :

Zone cible seulement /__/ Zone cible et zone témoin /__/ Zone cible et/ou zone témoin sans distinction /__/

4.2 Distance entre les zones (km) : .....

4.3 Définition d'une zone :

Fixe /__/ Variable /__/

Si elle est variable, veuillez indiquer les critères de définition :

.....

.....

4.4 Subdivisions des zones, le cas échéant (indiquer le nombre et la nature)

.....

.....

5. SITE DU PROJET

5.1 Terrain

Montagneux /__/ Accidenté /__/ Plat /__/

5.2 Superficie de la zone cible (km^2) : .....

5.3 Superficie de la zone témoin (km^2) : .....

5.4 Nombre de pluviomètres :

5.4.1 Tous types de pluviomètres dans la zone cible : .....

Tous types de pluviomètres dans la zone témoin : .....

5.4.2 Pluviographes dans la zone cible : .....

Pluviographes dans la zone témoin : .....

5.5 Autres mesures de vérification (par exemple, réflectivité radar, mesure des nuages par aéronefs, coussins à grêle, etc.) :

.....

.....

6. UNITE EXPERIMENTALE

6.1 Durée de l'unité en heures ou en jours : .....

6.2 Conditions permettant de déterminer si une unité est ensemençable ou pas :

.....

6.3 Nombre total d'unités ensemencées et non ensemencées (dans le cas de la conception avec zone cible et/ou zone témoin, sans distinction, ceci s'applique à chaque zone) :

.....

.....

ANNEXE B, p. 4

6.4 Répartition aléatoire des unités expérimentales :

Illimitée /__/ Limitée /__/

Dans ce dernier cas, indiquer la nature des limites fixées :

.....

6.5 Période standard d'ensemencement (heures) : .....

7. RESULTATS D'ENSEMBLE DU PROJET (pas de stratification ni de division)

7.1 Test(s) statistique(s) et/ou analyse(s) :

.....

7.2 Transformation(s) pour chaque test : .....

7.3 Résultats de chaque text et/ou analyse : .....

7.3.1 Qualitatifs :

Pas de différence	/__/	Augmentation des précipitations	/__/	Diminution des précipitations	/__/	Diminution de la masse de grêle	/__/

Autres résultats qualitatifs : .....

.....

7.3.2 Quantitatifs :

Rapport ensemencement/pas d'ensemencement : .....

Signification statistique : .....

8. CRITERES CHOISIS POUR L'EVALUATION DES RESULTATS

8.1 Spécifications analytiques fixées AVANT le projet

8.1.1 Nature de la ou des stratification(s), le cas échéant :

.....

8.1.2 Dimension de l'échantillon pour chaque stratification (nombre d'unités ensemencement/pas d'ensemencement) :

Ensemencement : ..... Pas d'ensemencement : .....

8.1.3 Test(s) et/ou analyse(s) pour chaque stratification :

.....

8.1.4 Transformation(s) pour chaque stratification et pour chaque test :

.....

8.1.5 Résultats pour chaque stratification, test et transformation :

Qualitatifs : .....

Quantitatifs : .....

8.2 Spécifications analytiques choisies APRES le projet

8.2.1 Nature de la ou des subdivision(s) :

.....

8.2.2 Dimension de l'échantillon pour chaque subdivision (nombre d'unité ensemencement/pas d'ensemencement) :

Ensemencement : ..... Pas d'ensemencement : .....

8.2.3 Test(s) et/ou analyse(s) pour chaque subdivision :

.....

8.2.4 Transformation(s) pour chaque subdivision et chaque test :

.....

8.2.5 Résultats pour chaque subdivision, test et transformation :

Qualitatifs : .....

Quantitatifs : .....

9. EFFETS OBSERVES (c'est-à-dire à l'extérieur de la zone cible)

9.1 Indice de l'effet : .....

9.2 Distance maximale observée : .....

9.3 Signification statistique (superficie de la zone et probabilité) :

.....

ANNEXE B, p. 6

10. COMMENTAIRES

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11. PRINCIPALES REFERENCES A DES RESULTATS PUBLIES (dans lesquels sont indiqués les détails des procédures ci-dessus) :

.....

.....

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.....

.....

ВСЕМИРНАЯ МЕТЕОРОЛОГИЧЕСКАЯ ОРГАНИЗАЦИЯ

R/CLA/4, ПРИЛОЖЕНИЕ B

ОТЧЕТ О ЗАВЕРШЕННОМ ПРОЕКТЕ ПО АКТИВНОМУ ВОЗДЕЙСТВИЮ НА ПОГОДУ

(Просьба поставить X в соответствующем квадрате)

ЧЛЕН ВМО: .....

1. ОПИСАНИЕ ПРОЕКТА

1.1 Обозначение проекта (название/местонахождение/организация) .....

.....

.....

.....

.....

.....

1.2 Цель(и) проекта:

Увеличение осадков - дождя ▱ снега ▱

Предотвращение града ▱

Предотвращение молний ▱

Другие (просьба указать): .....

.....

ПРИЛОЖЕНИЕ В, стр. 2

1.3 Основной тип облаков:

Орографические ▱ Кучевые ▱ Слоисто-образные ▱ Фронтальные ▱

2. ПРОДОЛЖИТЕЛЬНОСТЬ ПРОЕКТА

2.1 Продолжительность проекта по годам: .....

2.2 Оперативный период в каждом году:

С: ..... До: ..... включительно.

3. ЗАСЕВ

3.1 Реагент засева: AgI ▱ CO_2 ▱ NaCl ▱

Другие (просьба указать): .....

3.2 Генератор(ы): Наземные ▱ Воздушные ▱

Если генератор наземный, указать количество: .....

3.3 Процедура засева с воздуха:

Высота засева (м): .....

Длина трассы засева (м или км): .....

Норма засева (кг $ч^{-1}$): .....

4. ПОСТРОЕНИЕ ПРОЕКТА

4.1 Основная схема:

Целевые ▱ Целевые + контрольные ▱ Перекрестные ▱

4.2 Расстояние между районами (км): .....

4.3 Определение района:

Постоянный ▱ Переменный ▱

Если переменный, указать основу определения: .....

4.4 Подразделение района, если имеется (указать число и характер) ....

.....

5. ПЛОЩАДКА

5.1 Местность:

Горная ▱ Холмистая ▱ Ровная ▱

5.2 Размер целевого района ($км^2$): .....

5.3 Размер контрольного района ($км^2$): .....

5.4 Количество осадкомеров:

5.4.1 Все виды осадкомеров в целевом районе: .....

Все виды осадкомеров в контрольном районе: .....

5.4.2 Осадкомеры-самописцы в целевом районе: .....

Осадкомеры-самописцы в контрольном районе: .....

5.5 Другие средства проверки (например, отражательная способность радиолокаторов, измерения облаков с самолетов, градомеры и т.д.):

.....

6. ЭКСПЕРИМЕНТАЛЬНАЯ ЕДИНИЦА

6.1 Продолжительность единицы, в часах или днях:

.....

ПРИЛОЖЕНИЕ В, стр. 4

6.2 Условия для определения, подлежит ли единица засеву или нет: .....

.....

6.3 Общее количество засеянных и незасеянных единиц (при перекрестном построении это относится к каждому району):

.....

6.4 Рандомизация экспериментальных единиц:

Неограниченная ▱ Ограниченная ▱

Если ограниченная, то дать характер ограничения: .....

.....

6.5 Стандартный период засева: .....

7. ОБЩИЕ РЕЗУЛЬТАТЫ ПРОЕКТА (без стратификации и деления)

7.1 Название статистического испытания(ий) и/или анализа(ов):

.....

7.2 Трансформация(ии) для каждого испытания:

.....

7.3 Результаты каждого испытания и/или анализа: .....

7.3.1 Качественные:

Различий нет ▱ Больше осадков ▱ Меньше осадков ▱ Меньше града по массе ▱

Другие качественные результаты: .....

.....

7.3.2 Количественные:

Соотношение засев/нет засева ..... Статистическая значимость .....

8. ОБОСНОВАНИЕ ДЛЯ ОЦЕНКИ РЕЗУЛЬТАТОВ

8.1 Аналитические спецификации, установленные ДО проекта

8.1.1 Характер стратификации(ий), если имеется: .....

8.1.2 Объем выборки для каждой стратификации (число единиц засев/нет засева):

Засев: ..... Нет засева: .....

8.1.3 Испытание(я) и/или анализ(ы) для каждой стратификации:

.....

8.1.4 Трансформация(ии) для каждой стратификации и каждого испытания:

.....

8.1.5 Результаты для каждой стратификации, испытания или трансформации:

Качественные: .....

Количественные: .....

8.2 Аналитические спецификации, выбранные ПОСЛЕ проекта

8.2.1 Характер деления(ий): .....

8.2.2 Объем выборки для каждого деления (число единиц засев/нет засева):

Засев: ..... Нет засева: .....

8.2.3 Испытание(я) и/или анализ(ы) для каждого деления:

.....

ПРИЛОЖЕНИЕ В, стр. 6

8.2.4 Трансформация(ии) для каждого деления и каждого испытания:

.....

8.2.5 Результаты для каждого деления, испытания или трансформации:

Качественные: .....

Количественные: .....

9. ВОЗДЕЙСТВИЕ НА ДРУГИЕ РАЙОНЫ (т.е. за пределами целевого района)

9.1 Признак воздействия: .....

9.2 Максимальное расстояние: .....

9.3 Статистическая значимость (размер района и вероятность):

.....

10. ЗАМЕЧАНИЯ

.....

.....

.....

.....

11. ССЫЛКИ НА ОПУБЛИКОВАННЫЕ РЕЗУЛЬТАТЫ (в которых можно найти более детальную информацию):

.....

.....

.....

ORGANIZACION METEOROLOGICA MUNDIAL

R/CLA/4, ANEXO B

INFORME SOBRE PROYECTOS TERMINADOS DE MODIFICACION ARTIFICIAL DEL CLIMA

(Colóquese una X en la casilla o casillas que corresponde)

MIEMBRO DE LA OMM: .....

1. DESCRIPCION DEL PROYECTO

1.1 Identificación del proyecto (nombre/lugar/organización) .....

.....

.....

.....

.....

.....

.....

1.2 Finalidad(es) del proyecto

Aumento de las precipitaciones - lluvia /__/ nieve /__/

Supresión del granizo /__/

Supresión de los relámpagos /__/

Otros (sírvase especificar) : .....

.....

1.3 Principales tipos de nubes de que se trata:

Orográfica /__/ Cumulus /__/ Estratiforme /__/ Frontal /__/

2. DURACION DEL PROYECTO

2.1 Duración del proyecto en años: .....

2.2 Período en que se han llevado a cabo las operaciones durante cada año:

del: ..... al: ..... inclusive.

ANEXO B, p. 2

3. OPERACIONES DE SIEMBRA

3.1 Reactivo químico de siembra: AgI /__/ CO_2 /__/ NaCl /__/

Otros (sírvase especificar) : .....

3.2 Generador(es): Terrestre /__/ Aerotransportado /__/

Si es terrestre, sírvase dar el número de generadores: .....

3.3 Procedimiento de siembra mediante aeronaves:

Altitud de la siembra (m) .....

Longitud de la trayectoria de siembra (m o km) .....

Indice de la siembra (Kg h^{-1}) .....

4. CONCEPCION DEL PROYECTO

4.1 Concepción básica:

Sólo en la zona del blanco /__/

En la zona del blanco y zona de control /__/

En la zona del blanco y/o zona de control /__/

4.2 Distancia entre las zonas (km): .....

4.3 Determinación de la zona:

Fija /__/ Variable /__/

Si es variable, sírvase dar la base para la definición: .....

4.4 Subdivisiones de la zona, en caso de que hubieran (sírvase dar el número y la naturaleza) .....

.....

5. UBICACION DEL PROYECTO

5.1 Terreno donde se lleva a cabo el proyecto:

Montañoso /__/ Accidentado /__/ Llano /__/

5.2 Tamaño de la zona del blanco (km^2) .....

5.3 Tamaño de la zona de control (km^2) .....

5.4 Número de pluviómetros

5.4.1 Todos los tipos de pluviómetros en la zona del blanco: .....

Todos los tipos de pluviómetros en la zona de control: .....

5.4.2 Registro de los pluviómetros en la zona del blanco: .....

Registro de los pluviómetros en la zona de control:.....

5.5 Otra serie de verificaciones (por ejemplo reflectividad del radar, medida de las nubes mediante una aeronave, paquetes de granizo, etc.):

.....

.....

6. UNIDAD EXPERIMENTAL

6.1 Duración de la unidad en horas o días: .....

6.2 Condiciones que determinan si una unidad puede ser sembrada o no: ....

.....

6.3 Número total de unidades sembradas y no sembradas (en el caso de que el diseño sea de una zona del blanco y/o de control indistintamente esto se aplica a cada zona):

.....

6.4 Selección aleatoria de las unidades experimentales:

No limitada /__/ Limitada /__/

Si es limitada, sírvase dar el carácter de la limitación: .....

.....

6.5 Período de siembra normalizado (horas): .....

7. RESULTADOS DE LOS PROYECTOS GENERALES (no estratificación o partición)

7.1 Nombre de la(s) prueba(s) estadística(s) y/o análisis: .....

.....

7.2 Transformación(es) para cada prueba: .....

7.3 Resultados de cada prueba y/o análisis: .....

ANEXO B, p. 4

7.3.1 Cualitativo:

No hay diferencia	/__/	Más precipitación	/__/	Menos precipitación	/__/	Menos masa de granizo	/__/

Otros resultados cualitativos: .....

.....

7.3.2 Cuantitativo:

Relación de la siembra/no siembra: .....

Significado estadístico: .....

8. BASE PARA LA EVALUACION DE LOS RESULTADOS

8.1 Especificaciones analíticas fijadas ANTES de que se haya llevado a cabo el proyecto

8.1.1 Carácter de la estratificación(es), en caso de que hubiere: .....

8.1.2 Tamaño de muestra para cada estratificación (número de unidades de siembra/o sin siembra):

Siembra: ..... Sin siembra: .....

8.1.3 Prueba(s) y/o análisis para cada estratificación:

.....

8.1.4 Transformación(es) para cada estratificación y cada prueba:

.....

8.1.5 Resultados para cada estratificación, prueba y transformación:

Cualitativo : .....

Cuantitativo : .....

8.2 Especificaciones analíticas seleccionadas DESPUES de revisarse el proyecto:

8.2.1 Carácter de la partición(es): .....

8.2.2 Tamaño de muestra para cada partición (número de unidades de siembra/ sin siembra):

Siembra: ..... Sin siembra: .....

8.2.3 Prueba(s) y/o análisis para cada partición:

.....

8.2.4 Transformación(es) para cada partición y cada prueba:

.....

8.2.5 Resultados para cada partición, prueba y tranformación:

Cualitativa: .....

Cuantitativa: .....

9. EFECTOS QUE TIENE FUERA DE LA ZONA (por ejemplo fuera de la zona del blanco)

9.1 Indicio del efecto: .....

9.2 Distancia máxima observada: .....

9.3 Significado estadístico (tamaño de la zona y probabilidad):

.....

10. COMENTARIOS

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11. PRINCIPALES REFERENCIAS PARA QUE SE PUBLIQUEN LOS RESULTADOS (lugar en el que se pueden encontrar los detalles antes mencionados):

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.....

LIST OF WEATHER MODIFICATION PROGRAMME REPORTS

WMP-No. 1	Review of Warm Cloud Modification by Bh. V. Ramana Murty (September 1984)	WMO/TD-No. 5
WMP-No. 2	Papers Presented at the Fourth WMO Scientific Conference on Weather Modification (Honolulu, Hawaii, 12-14 August 1985)	WMO/TD-No. 53
WMP-No. 3	Notes for the International Cloud Modelling Workshop/Conference (Irsee, Federal Republic of Germany, 15-19 July 1985). (Out of print)	WMO/TD-No. 57
WMP-No. 4	Register of National Weather Modification Projects 1983 (November 1985)	WMO/TD-No. 78
WMP-No. 5.	The Evaluation of Hail Suppression Experiments - Report of Meeting of Experts (March 1986)	WMO/TD-No. 97
WMP-No. 6	Information Concerning Weather Modification Directed to Government Decision-Makers (June 1986)	WMO/TD-No. 123
WMP-No. 7	Trends in Weather Modification - 1975-1983 (L.R. Koenig, Geneva, November 1986)	-
WMP-No. 8	Report of the International Cloud Modelling Workshop (Irsee, Federal Republic of Germany, 15-19 July 1985)	WMO/TD-No. 139
WMP-No. 9	Register of National Weather Modification Projects - 1984 and 1985 (Geneva, July 1987)	WMO/TD-No. 182
WMP-No. 10	Register of National Weather Modification Projects - 1986 (Geneva, December 1988)	WMO/TD-No. 208
WMP-No. 11	Report of the Second International Cloud Modelling Workshop (Toulouse, 8-12 August 1988)	WMO/TD-No. 268
WMP-No. 12	Proceedings for the Fifth WMO Scientific Conference on Weather Modification and Applied Cloud Physics (Beijing, China, 8-12 May 1989)	WMO/TD-No. 269

LIST OF PRECIPITATION ENHANCEMENT PROJECTS REPORTS

Report No. 1	Report of the First Session of the Interim Precipitation Enhancement Project Board (Geneva, November 1976)
Report No. 2	Position Papers Used in the Preparation of the Plan for PEP (Geneva, November 1976)
Report No. 3	Plan for the Precipitation Enhancement Project (Geneva, November 1976)
Report No. 4	A Review of the Hydrological Aspect of Evaluation of Precipitation Enhancement (Geneva, May 1977)
Report No. 5	Cloud Seeding Reagents (Sofia, Bulgaria, October 1977) (Geneva, November 1977)
Report No. 6	Areal Extent of Seeding Effects in Relation to the Precipitation Enhancement Project (Charlottsville, VA, USA, November 1977) - (Geneva, December 1977)
Report No. 7	Aircraft Instrumentation for Cloud Physics Research and Weather Modification Programmes (Boulder, CO, USA, February 1978) - (Geneva, March 1978)
Report No. 8	Report of the Second Session of the Interim Precipitation Enhancement Project Board - (Geneva, April 1978)
Report No. 9	PEP Design Document - (Geneva, April 1978)
Report No. 10	Survey of the Climatology and Synoptic Weather Patterns at the Proposed PEP Site in Spain - (Geneva, November 1978)
Report No. 11	Operations Plan for Site-Selection Phase-3 (Geneva, November 1978)
Report No. 12	Preliminary Environmental Impact Study of the Site Proposed for PEP (Geneva, December 1978) - (Geneva, August 1979)
Report No. 13	WMO Training Workshop on Weather Modification for Meteorologists - Lecture Notes - (Geneva, December 1979)
Report No. 14	The Dispersion of Cloud Seeding Reagents (Valladolid, Spain, March 1979) - (Geneva, April 1980)
Report No. 15	PEP Site Selection Phase-3, 1979 Field Programme - Overview and Data Catalogue - (Geneva, February 1980)
Report No. 16	Report of the Third Session of the Precipitation Enhancement Project Board (Geneva, September 1979) (Geneva, November 1979)

LIST OF PEP PROJECTS REPORTS, p. 2

Report No. 17	Statistical Design Considerations for Precipitation Enhancement Projects (Moscow, USSR, 29 October to 2 November 1979) - (Geneva, February 1980)
Report No. 18	PEP Site Selection Phase-3, 1979 Field Programme - General Weather Conditions and Rainfall Characteristics (Geneva, March 1980)
Report No. 19	PEP Site Selection Phase-3, 1979 Field Programme - Two Studies of Precipitation Patterns - (Geneva, March 1980)
Report No. 20	Report of the Fourth Session of the Precipitation Enhancement Project Board (Valladolid, Spain, May 1980) (Geneva, May 1980)
Report No. 21	PEP Site Selection Phase-3, 1980 Field Season - Overview and Data Catalogue - (Geneva, October 1980)
Report No. 22	PEP Site Selection Phase-3, 1980 Field Season - General Weather Conditions and Cloud Structures (Geneva, November 1980)
Report No. 23	Rainstorms, Synoptic Background and Radar-Seen Clouds During the 1980 PEP Season - (Geneva, November 1980)
Report No. 24	The Uses of Numerical Models in Weather Modification Research and Operations (Toronto, Montreal, Canada, December 1980) - (Geneva, April 1981)
Report No. 25	Report of the Fifth Session of the Precipitation Enhancement Project Board (Geneva, May 1981) - (Geneva, May 1981)
Report No. 26	PEP Site Selection Phase-3, 1981 Field Season - Data Catalogue Weather Conditions and Cloud Structures (Geneva, September 1981)
Report No. 27	Report of the Sixth Session of the Precipitation Enhancement Project Board (Geneva, March 1982) - (Geneva, April 1982)
Report No. 28	Preliminary Assessment Report of the Site Selection Phase-3 of the Precipitation Enhancement Project (Geneva, April 1982)
Report No. 29	PEP Site Selection Phase-3 - Studies Based on Data Acquired by Radar (Geneva, January 1983)
Report No. 30	PEP Site Selection Phase-3, Supplementary Report on Analysis of Duero River Basin Data (Geneva, February 1984)
Report No. 31	Modification of Precipitation from Cumulus Clouds (Geneva, February 1984)
Report No. 32	Numerical Simulation of Cloud Behavior Based on Duero River Basin Data (Geneva, June 1984)

Report No. 33 PEP Site Selection Phase-3, Descriptions of Regions of Potential Identified by Aerial Reconnaissance (Geneva, May 1985)

Report No. 34 Synopsis of the Precipitation Enhancement Project - 1985 (Geneva, August 1986)