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Weather Resources Management and Interbasin Transfer Law [outline]

Ray Jay Davis

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WEATHER RESOURCES MANAGEMENT AND
INTERBASIN TRANSFER LAW

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Professor of Law
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New Sources of Water for Energy
Development and Growth: Interbasin Transfers

a short course sponsored by the
Natural Resources Law Center
University of Colorado School of Law
June 7-10, 1982

1

2

3

WEATHER RESOURCES MANAGEMENT AND INTERBASIN TRANSFER LAW

by

Ray Jay Davis

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INTRODUCTION

Weather resources management -- a new dimension for water resources and interbasin transfer law

I. TECHNOLOGY

Able (Figure 1 - 9) (Technological background)

Natural precipitation processes
Physics of artificial nucleation
Cloud seeding equipment
Seeding techniques

Surface and ground water diversion technologies as analogies

Baker (Figure 10) (Measurement and evaluation of impacts)

Measurement of seeding activities
Record keeping and reporting

Evaluation of seeding impacts

Necessary in order to --

Improve weather resources management skills
Secure continued funding of projects
Assess legal consequences -- the causation issue

II. LEGAL REGULATION OF TECHNOLOGY USE

Charlie (Figure 11) (Professional licensing of weather modifiers)

Professional competency
Professional ethics

Dog (Figure 12) (Project permitting)

Parameters of project design and operation

Extent of legal regulation of projects
Types of regulatory activity

Deregulation

III. TECHNOLOGY AND INTERBASIN TRANSFER

Easy (Figure 13) (Financing)

Assume no interbasin transfer --
Illinois and the "third year syndrome"
North Dakota, Utah and governmental funding

Fox (Figures 14 and 15) (Intended interbasin transfer)

Assume intend interbasin transfer --
Northern Cascades and targeting
New York City and flooding

Weather modification case law
Transferability of technology and of case law

George (Figures 16 and 17) (Incidental interbasin transfer)

Assume incidental interbasin transfer --
Colorado Front Range/Western Slope --
TAMS -- experimental project)
CREST -- operational project) Rainshadow and exploitation

Weather resources allocation statutory law

CONCLUSION

How (Integration)

Weather resources management technology and law should be
integrated with ground and surface water technology and law

CLOUD SEQUENCE - Not Seeded

FIGURE 1

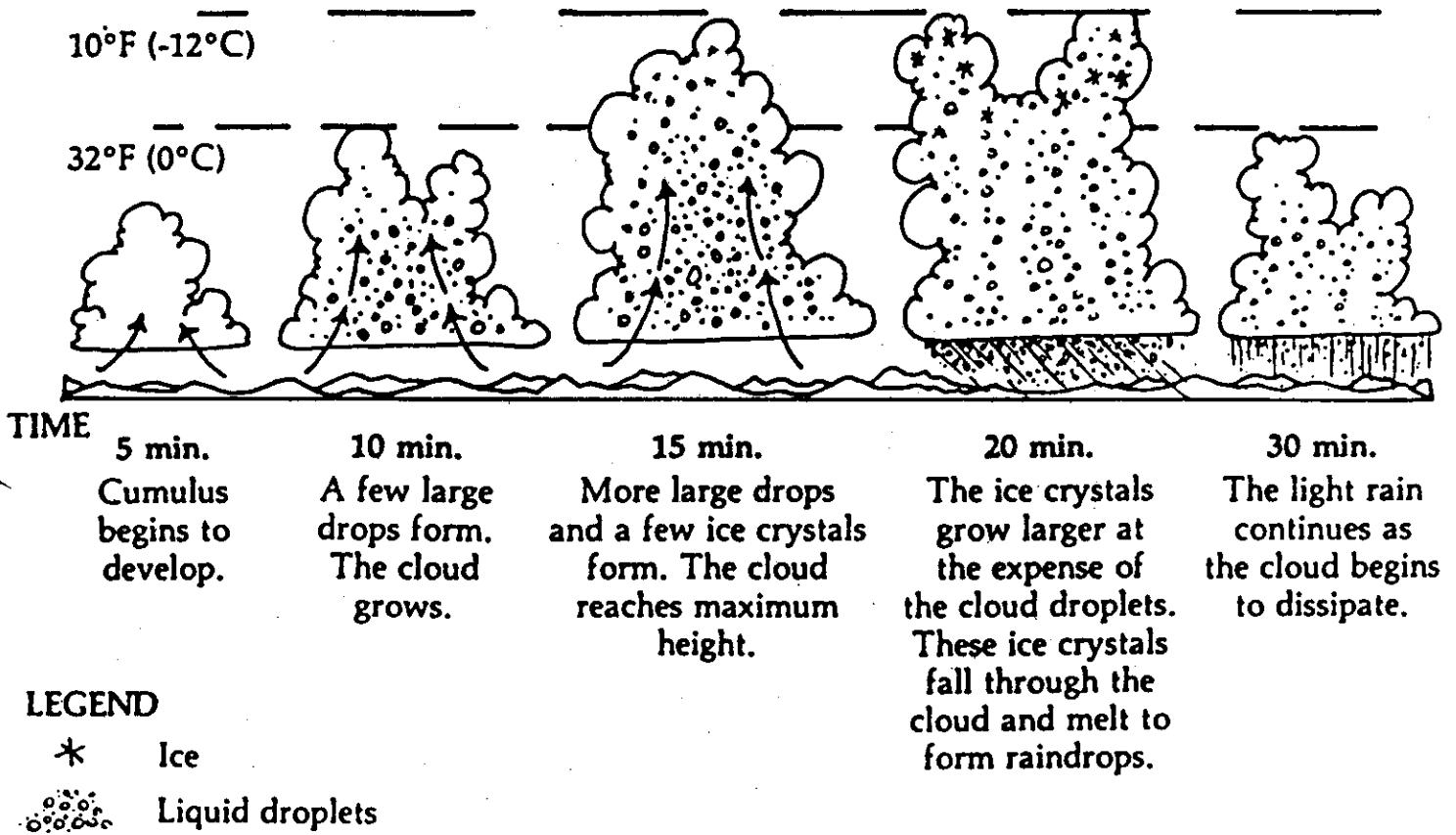


FIGURE 2

Growth of ice crystals from drop evaporation

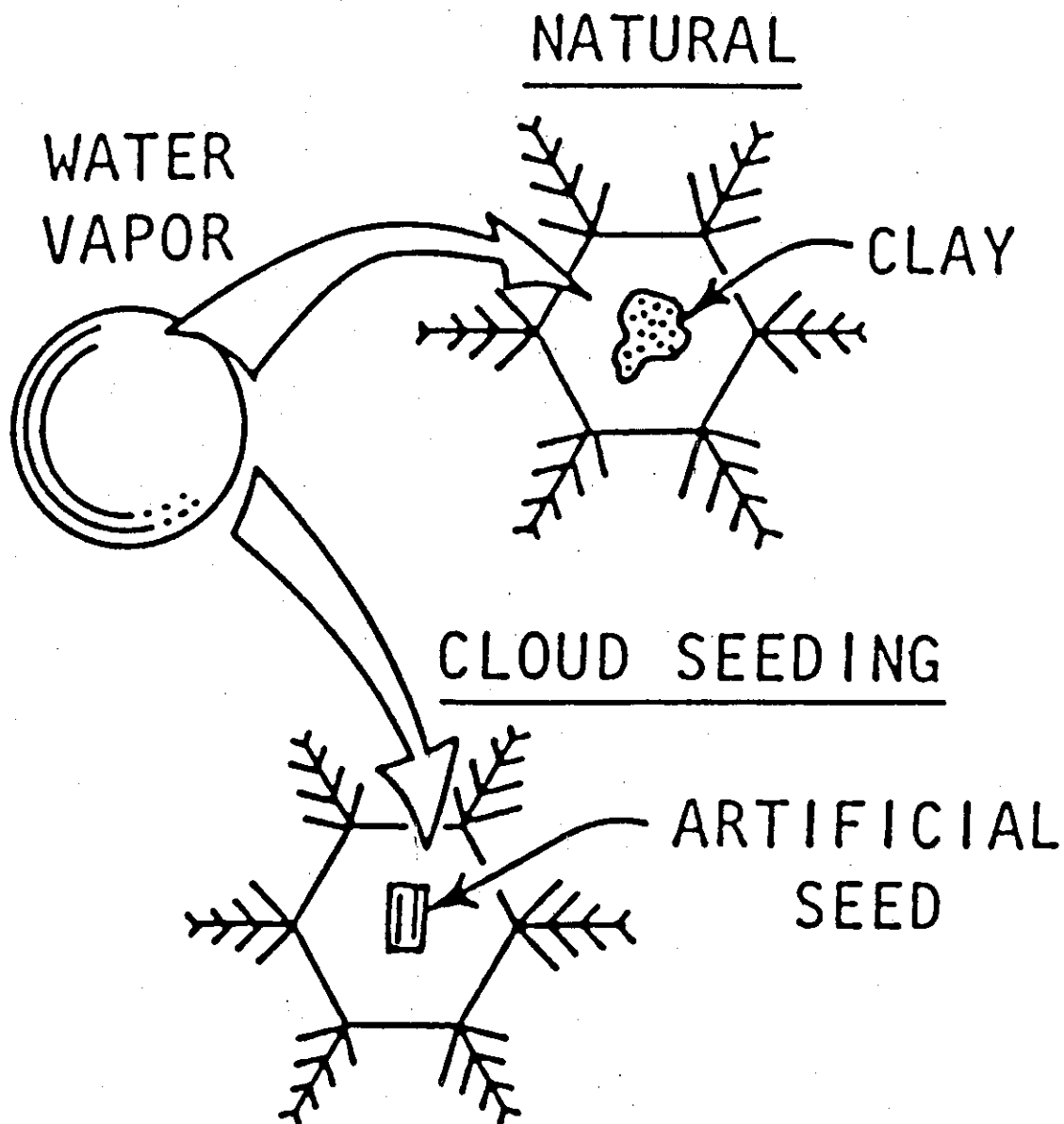


FIGURE 3

Effect of added heat from seeding

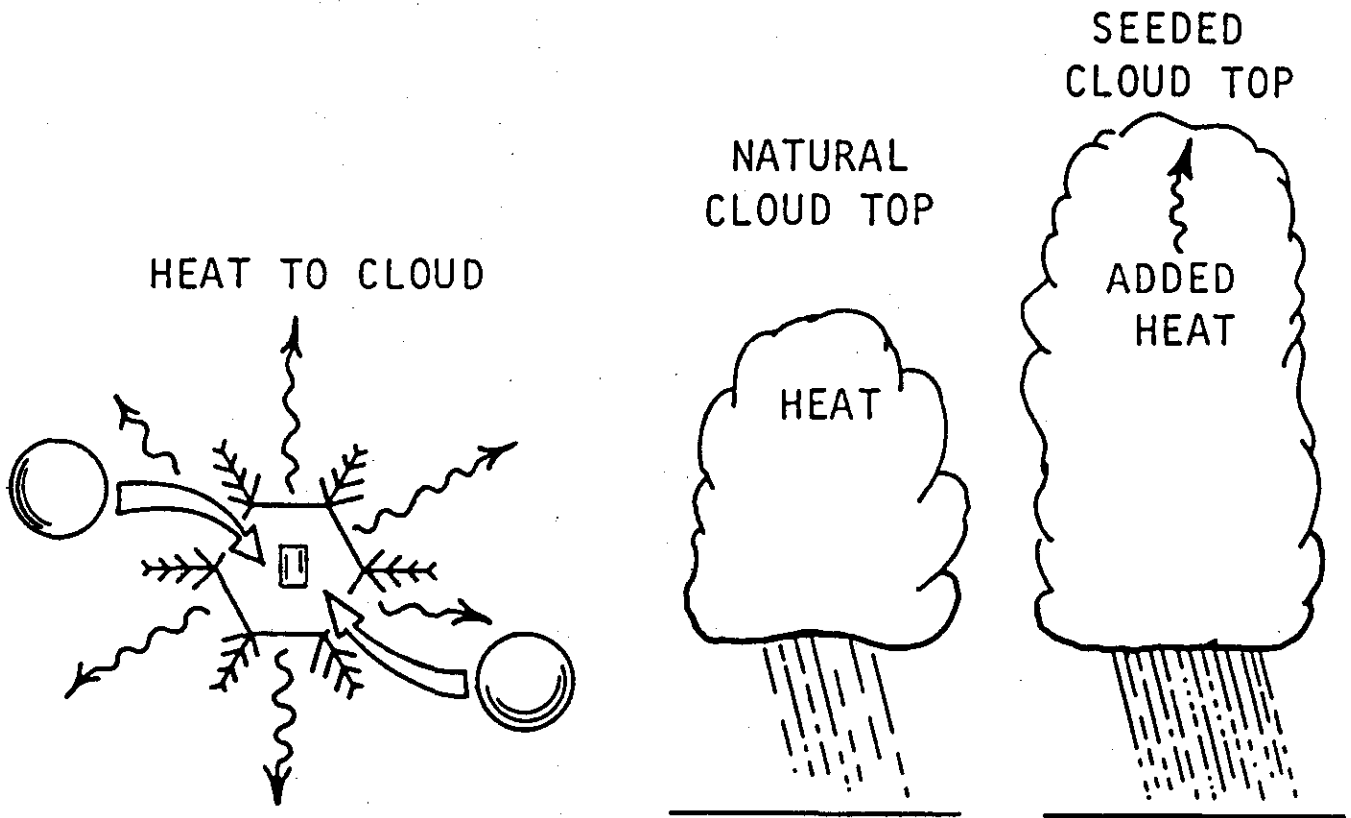


FIGURE 4

Some methods of cloud seeding

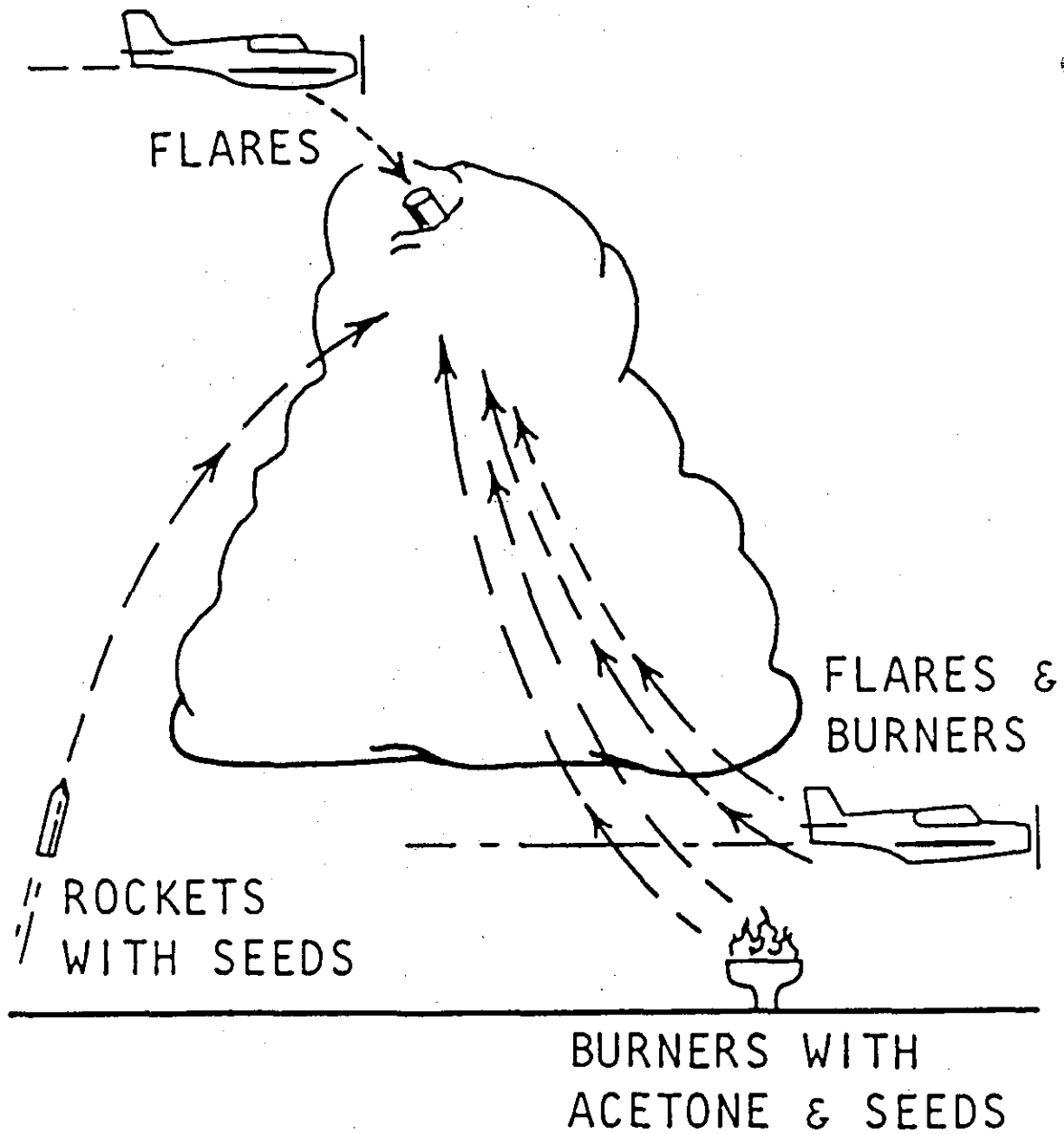


FIGURE 5

Acetone AgI generator on wing tip of seeding aircraft

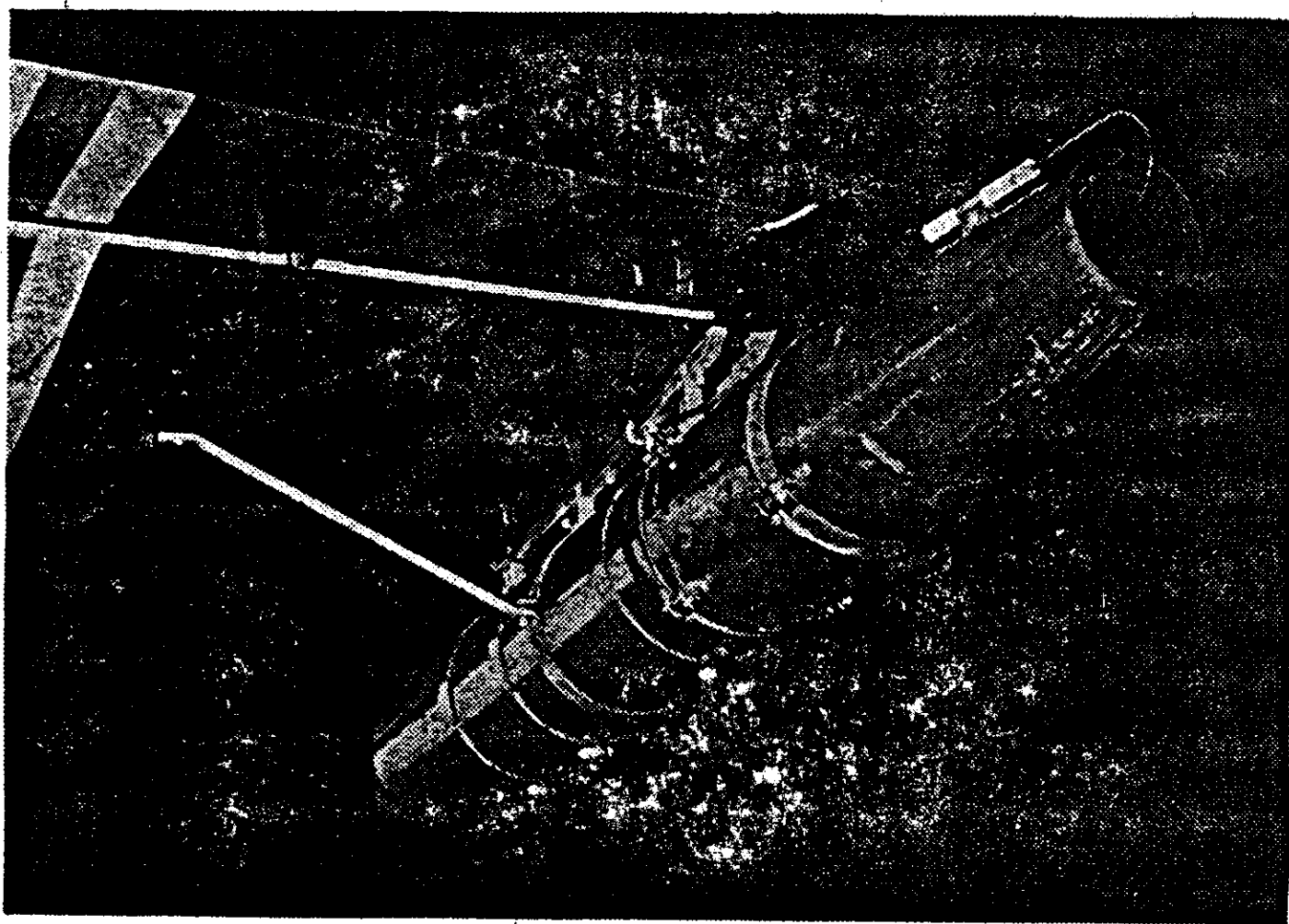
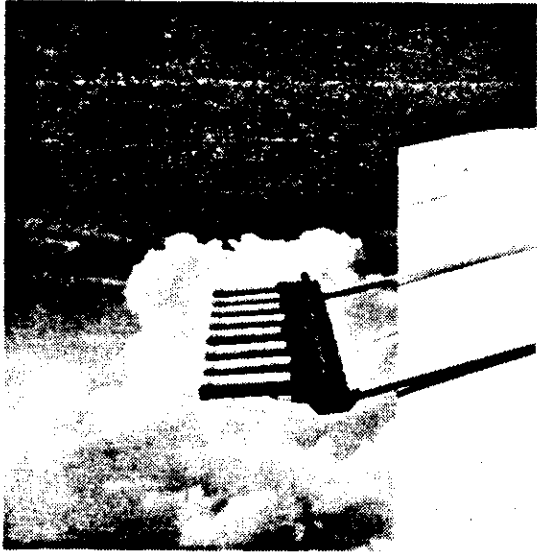


FIGURE 6

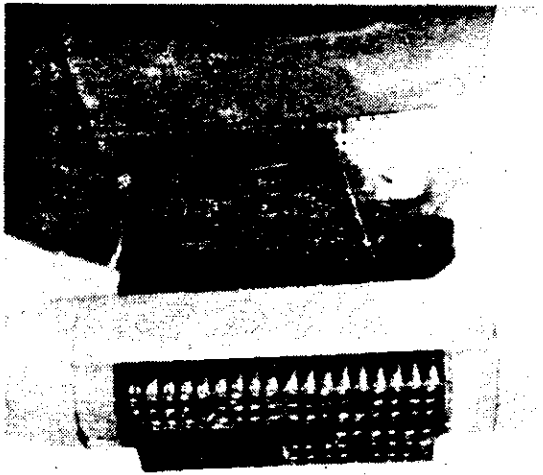
Pyrotechnic devices, either mounted or droppable, to release AgI



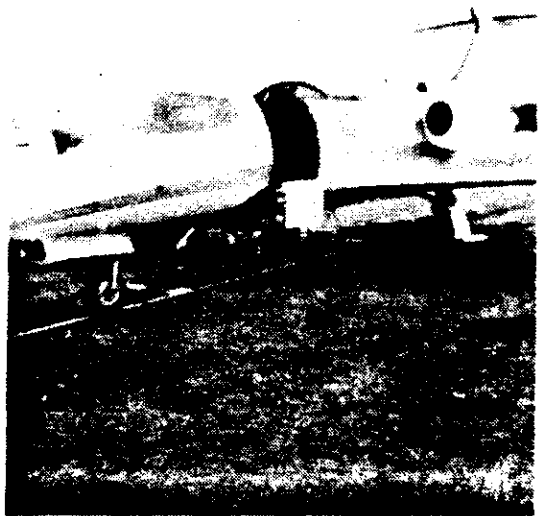
Mounted pyrotechnic flares



Same flares burning in flight



Container to drop fuses mounted on wing of NOAA aircraft used in Florida experiment

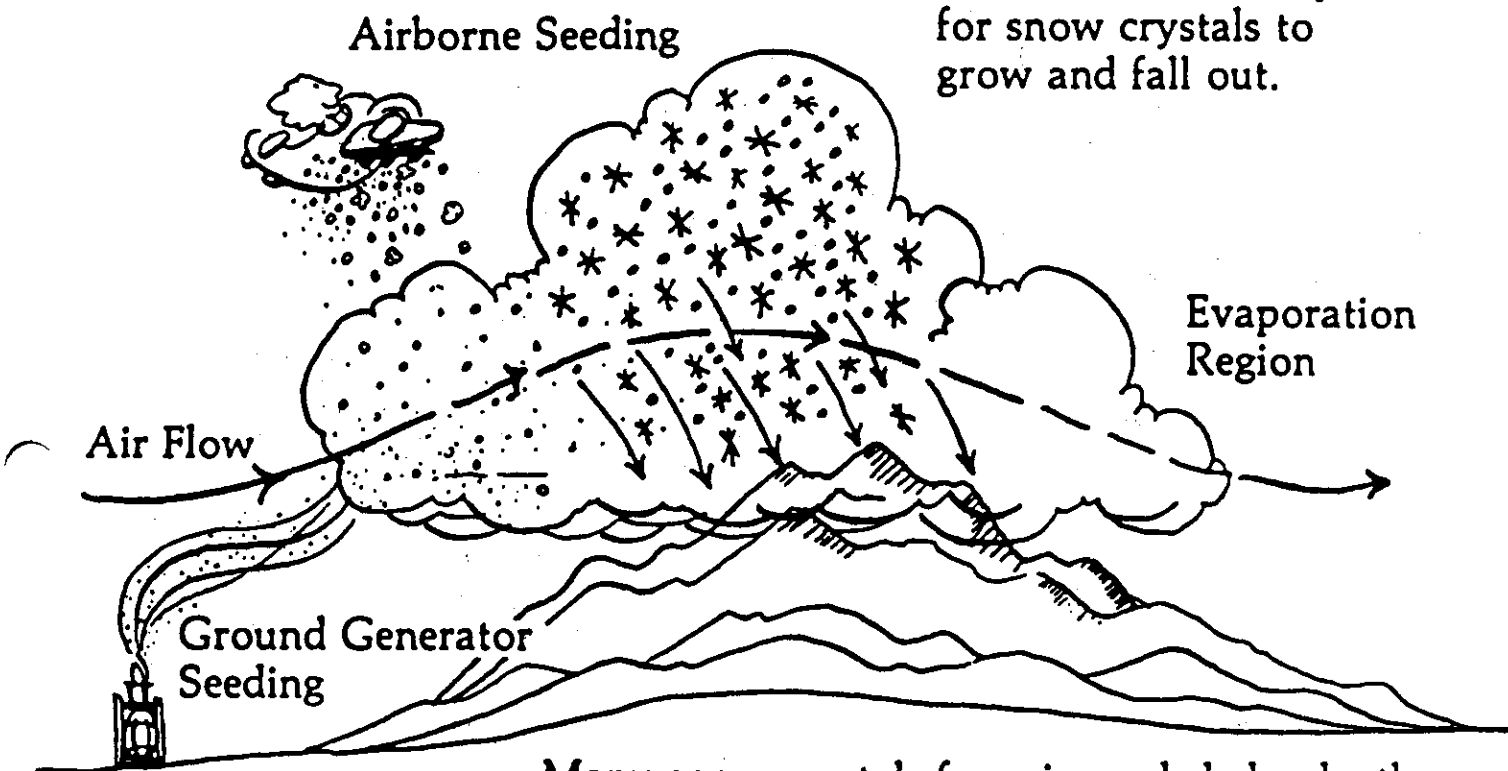


Flare container built in bottom of modified Lear jet used to drop flares for hail suppression in South Africa

SEEDED MOUNTAIN CLOUD

FIGURE 7

15 to 30 minutes required
for snow crystals to
grow and fall out.

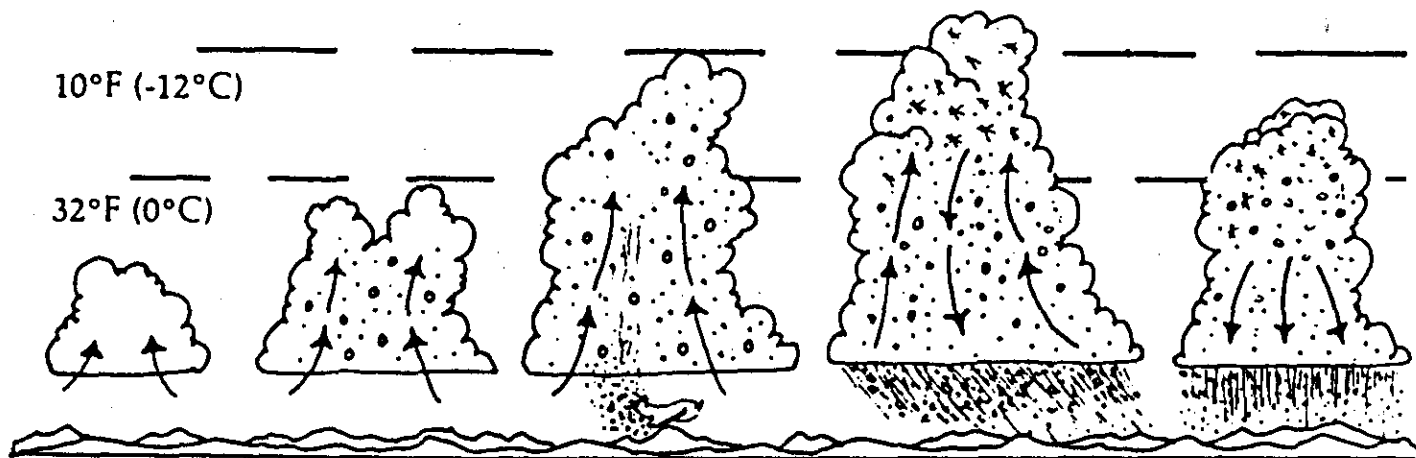


Many snow crystals form in seeded clouds, thus
depositing some of the cloud water on the ground.

CLOUD SEQUENCE - Seeded

FIGURE 8

(Objective 1. Used when updrafts are less than 2,000 feet per minute and conditions are not favorable for stimulating cloud growth through dynamic processes)



TIME

5 min.

Cumulus begins to develop.

10 min.

A few large drops form. The cloud grows.

15 min.

The cloud seeding material is delivered into the updraft near cloud base.

30 min.

Many ice crystals form in the supercooled region of the cloud and grow at the expense of the cloud droplets. Precipitation begins when large ice crystals fall and melt.

50 min.

Moderate rain continues as the cloud begins to dissipate.

LEGEND

* Ice

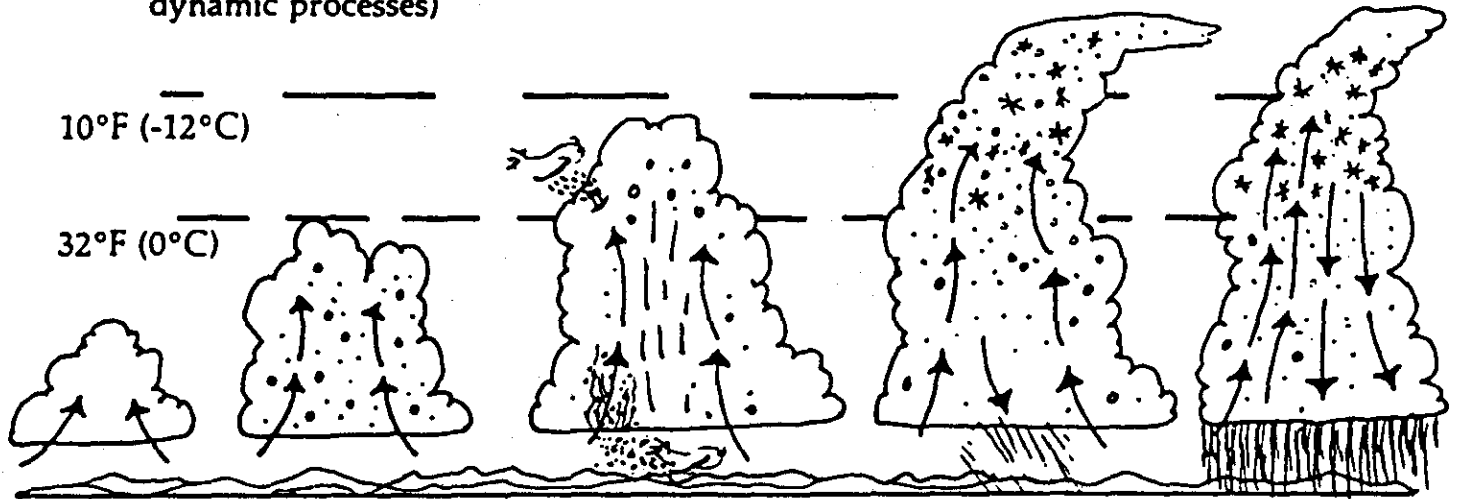
••••• Liquid droplets

••••• Seeding material (nuclei)

CLOUD SEQUENCE - Seeded

FIGURE 9

(Objective 2. Used when updrafts are strong and cloud can be stimulated to grow by enhancing the dynamic processes)



TIME

- | | | | | |
|----------------------------|--|---|--|--|
| 5 min. | 10 min. | 15 min. | 30 min. | 50 min. |
| Cumulus begins to develop. | A few large drops form. The cloud grows. | A concentrated charge of seeding material is delivered into the updraft near cloud base or into the cloud top region. | Latent heat is released when supercooled drops freeze which causes substantial cloud growth. | Much more water is processed by this larger cloud resulting in more precipitation on the ground. |

LEGEND

- * Ice
- Liquid droplets
- Seeding material (nuclei)

FIGURE 10

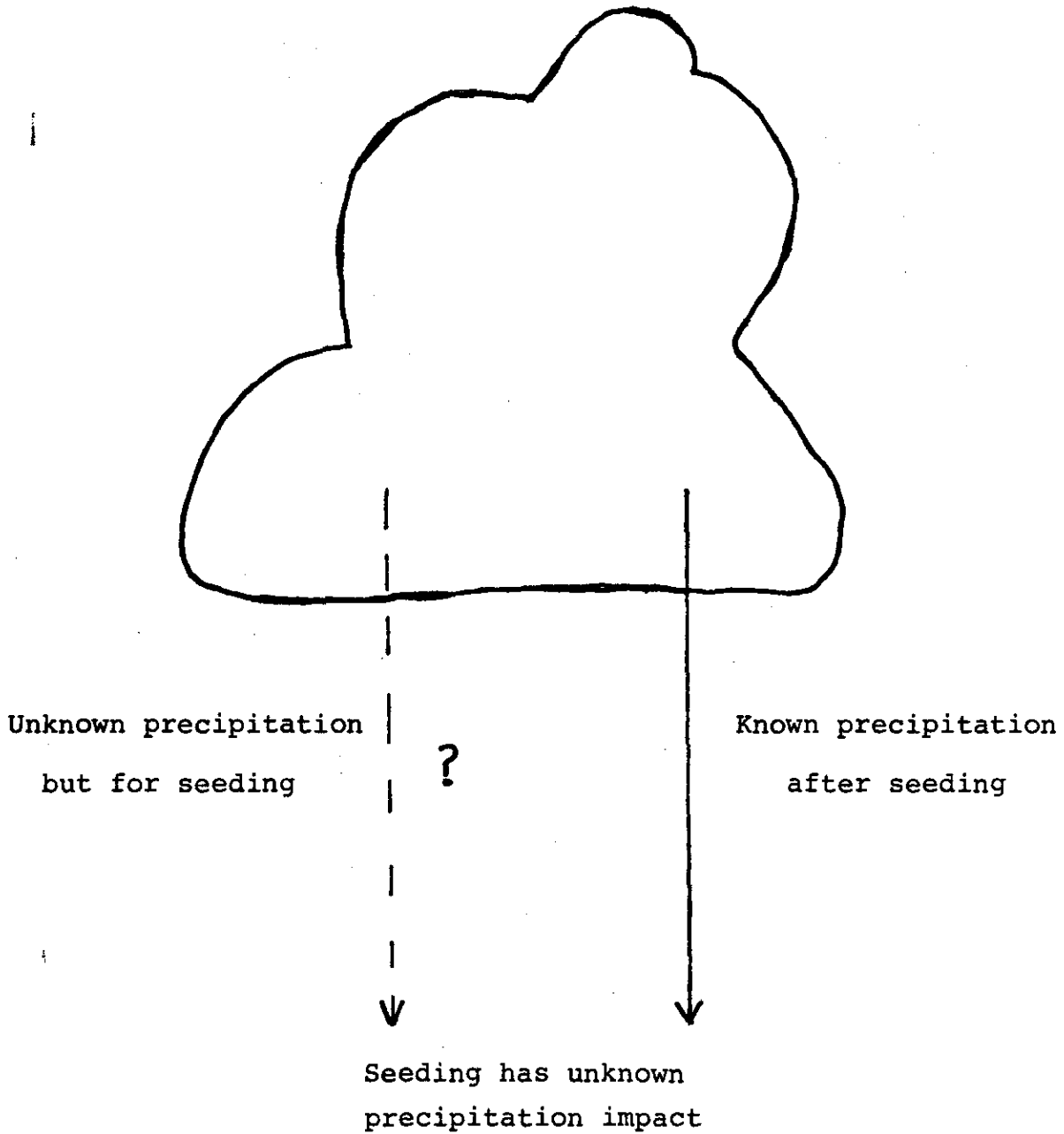


FIGURE 11

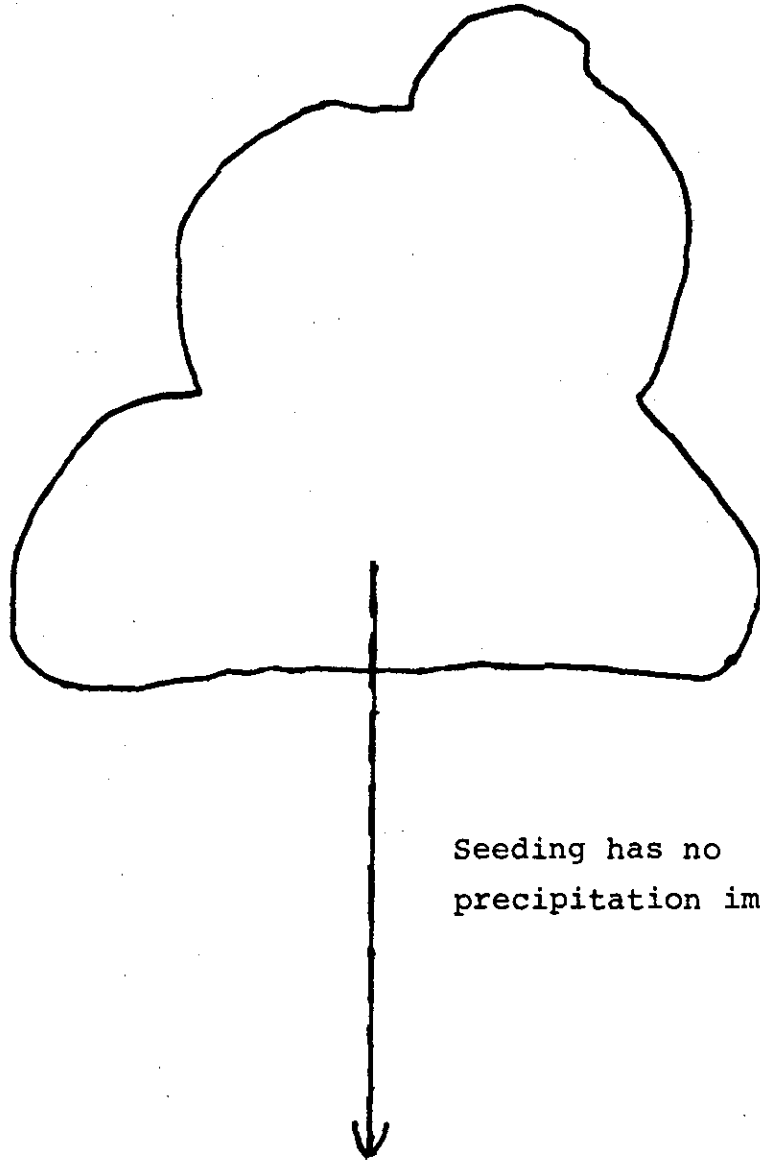


FIGURE 12

Weather control administrative structure

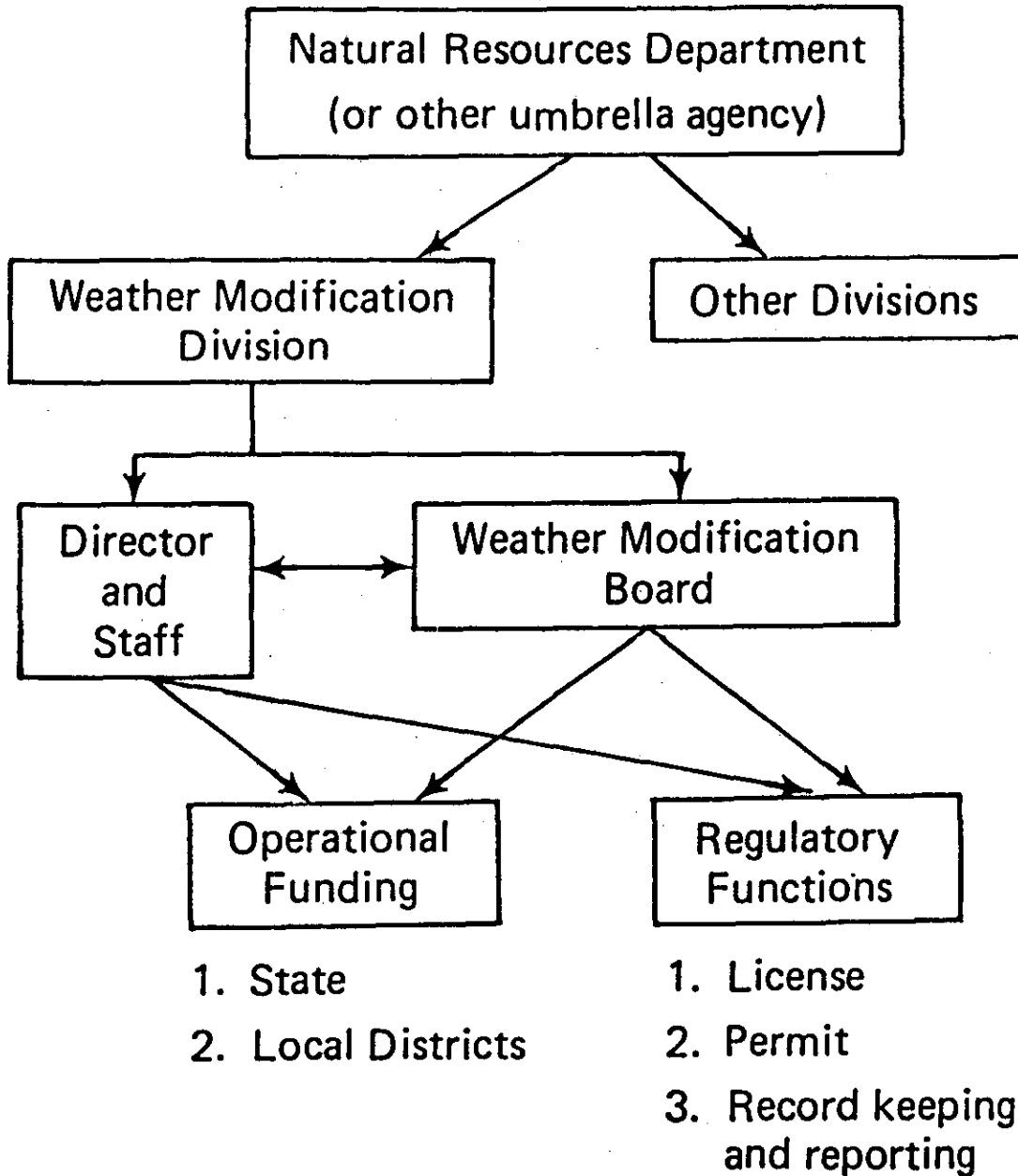
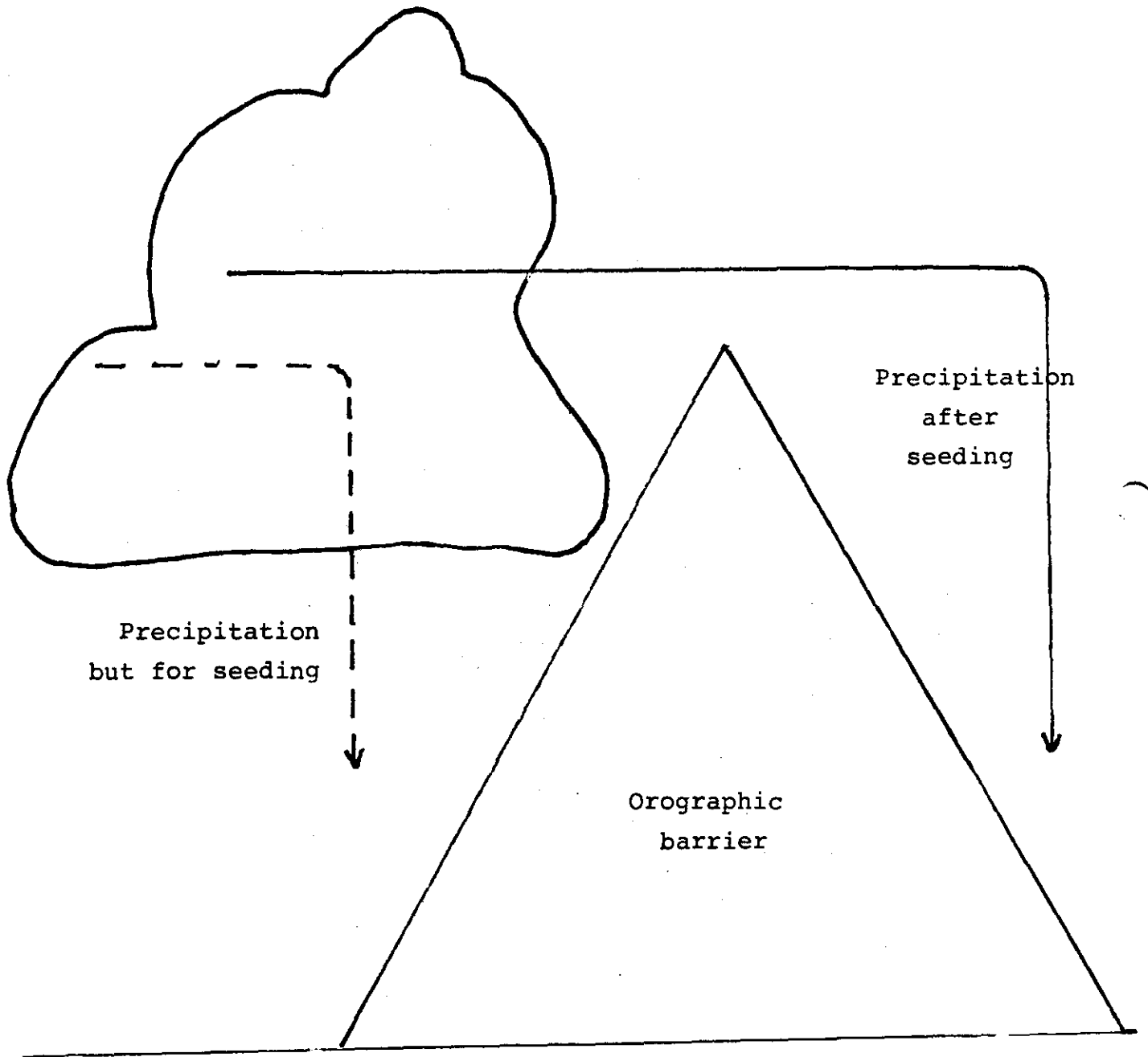


FIGURE 13

Types of authorization laws for governmental funding

- Type 1 → Authority delegated by legislature to *existing state and local agencies* to spend funds for conduct and sponsorship of weather modification
- Example — New York
Municipalities given seeding authority
- Type 2 → Authority delegated by legislature to *state weather modification administrative agency* to spend funds for conduct and sponsorship of weather modification
- Example — Utah
Division of Water Resources which regulates weather modification also authorized to conduct operations
- Type 3 → Legal mechanism set up whereby *local weather modification districts* can be created which will have the power to tax and spend monies for conduct and sponsorship of weather modification
- Example — Texas
Voters can set up weather modification districts

FIGURE 14



Intended Diversion

FIGURE 15

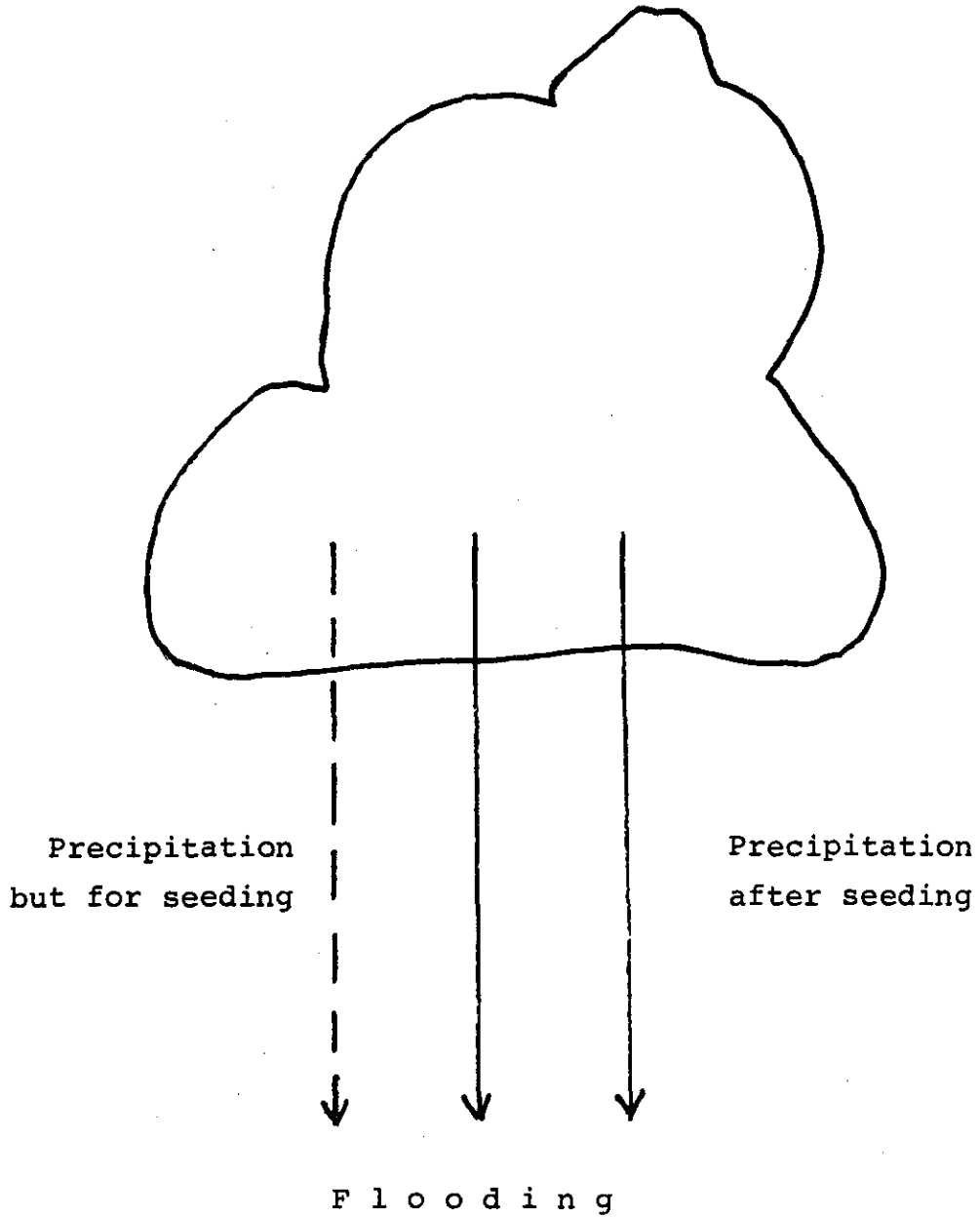
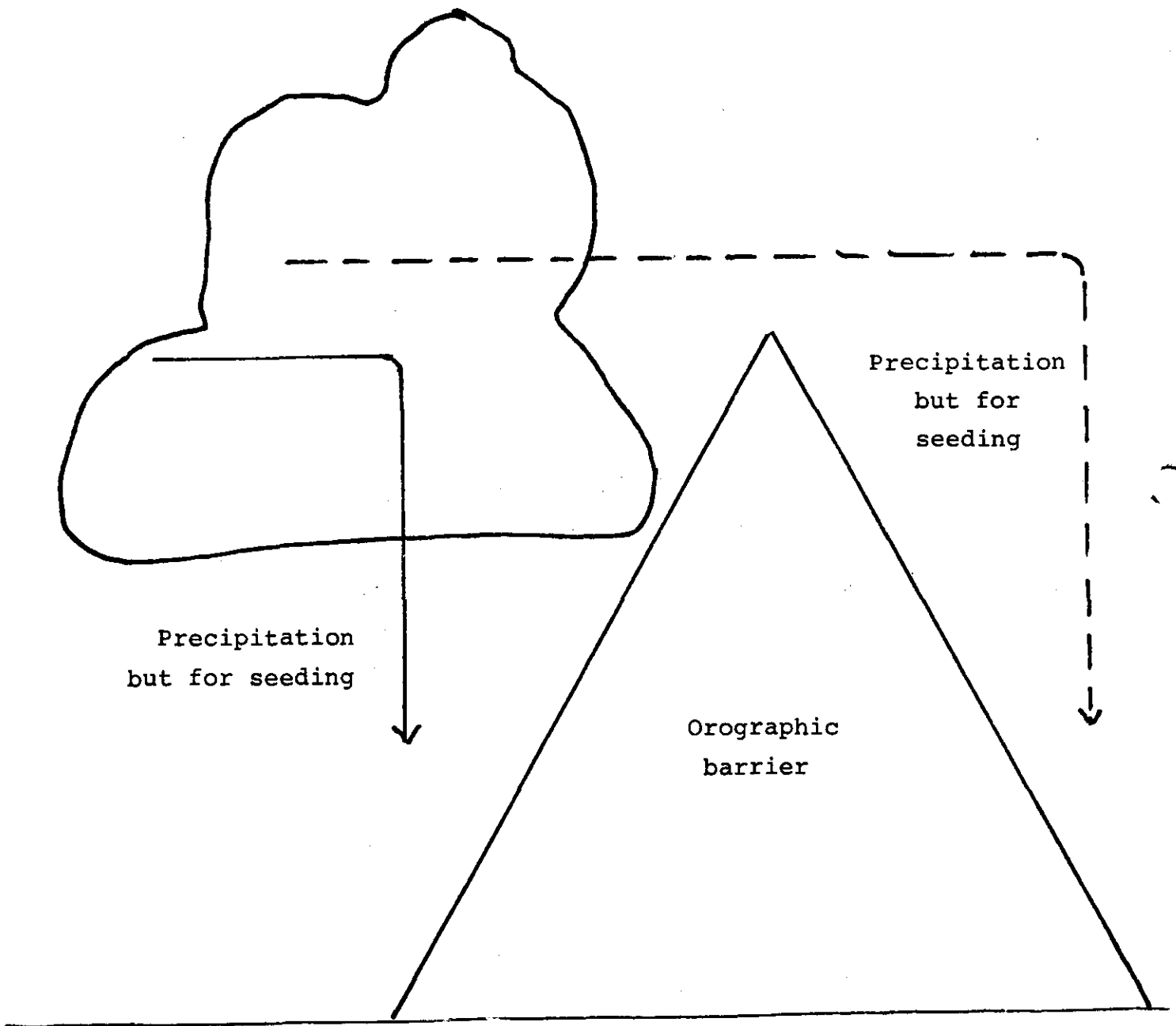


FIGURE 16



Incidental Diversion

FIGURE 17

