

Weather as a Force Multiplier: Owning the Weather in 2025



A Research Paper

Presented To

Air Force **2025**

by

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Disclaimer

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Executive Summary

In 2025, US aerospace forces can "own the weather" by capitalizing on emerging technologies and focusing development of those technologies to war-fighting applications. Such a capability offers the war fighter tools to shape the battlespace in ways never before possible. It provides opportunities to impact operations across the full spectrum of conflict and is pertinent to all possible futures. The purpose of this paper is to outline a strategy for the use of a future weather-modification system to achieve military objectives rather than to provide a detailed technical road map.

A high-risk, high-reward endeavor, weather-modification offers a dilemma not unlike the splitting of the atom. While some segments of society will always be reluctant to examine controversial issues such as weather-modification, the tremendous military capabilities that could result from this field are ignored at our own peril. From enhancing friendly operations or disrupting those of the enemy via small-scale tailoring of natural weather patterns to complete dominance of global communications and counterspace control, weather-modification offers the war fighter a wide-range of possible options to defeat or coerce an adversary. Some of the potential capabilities a weather-modification system could provide to a war-fighting commander in chief (CINC) are listed in table 1.

Technology advancements in five major areas are necessary for an integrated weather-modification capability: (1) advanced nonlinear modeling techniques, (2) computational capability, (3) information gathering and transmission, (4) a global sensor array, and (5) weather intervention techniques. Some intervention tools exist today and others may be developed and refined in the future.

Table 1 - Operational Capabilities Matrix

DEGRADE ENEMY FORCES	ENHANCE FRIENDLY FORCES
Precipitation Enhancement	Precipitation Avoidance
- Flood Lines of Communication	- Maintain/Improve LOC
- Reduce PGM/Recce Effectiveness	- Maintain Visibility
- Decrease Comfort Level/Morale	- Maintain Comfort Level/Morale
Storm Enhancement	Storm Modification
- Deny Operations	- Choose Battlespace Environment

Precipitation Denial	Space Weather
- Deny Fresh Water	- Improve Communication Reliability
-- Induce Drought	- Intercept Enemy Transmissions
Space Weather	- Revitalize Space Assets
- Disrupt Communications/Radar	Fog and Cloud Generation
- Disable/Destroy Space Assets	- Increase Concealment
Fog and Cloud Removal	Fog and Cloud Removal
- Deny Concealment	- Maintain Airfield Operations
- Increase Vulnerability to PGM/Recce	- Enhance PGM Effectiveness
Detect Hostile Weather Activities	Defend against Enemy Capabilities

Current technologies that will mature over the next 30 years will offer anyone who has the necessary resources the ability to modify weather patterns and their corresponding effects, at least on the local scale. Current demographic, economic, and environmental trends will create global stresses that provide the impetus necessary for many countries or groups to turn this weather-modification ability into a capability.

In the United States, weather-modification will likely become a part of national security policy with both domestic and international applications. Our government will pursue such a policy, depending on its interests, at various levels. These levels could include unilateral actions, participation in a security framework such as NATO, membership in an international organization such as the UN, or participation in a coalition. Assuming that in 2025 our national security strategy includes weather-modification, its use in our national military strategy will naturally follow. Besides the significant benefits an operational capability would provide, another motivation to pursue weather-modification is to deter and counter potential adversaries.

In this paper we show that appropriate application of weather-modification can provide battlespace dominance to a degree never before imagined. In the future, such operations will enhance air and space superiority and provide new options for battlespace shaping and battlespace awareness.¹ "The technology is there, waiting for us to pull it all together;"² in 2025 we can "Own the Weather."

Chapter 1 Introduction

Scenario: Imagine that in 2025 the US is fighting a rich, but now consolidated, politically powerful drug cartel in South America. The cartel has purchased hundreds of Russian-and Chinese-built fighters that have successfully thwarted our attempts to attack their production facilities. With their local numerical superiority and interior lines, the cartel is launching more than 10 aircraft for every one of ours. In addition, the cartel is using the French *system probatoire d'observation de la terre* (SPOT) positioning and tracking imagery systems, which in 2025 are capable of transmitting near-real-time, multispectral imagery with 1 meter resolution. The US wishes to engage the enemy on an uneven playing field in order to exploit the full potential of our aircraft and munitions.

Meteorological analysis reveals that equatorial South America typically has afternoon thunderstorms on a daily basis throughout the year. Our intelligence has confirmed that cartel pilots are reluctant to fly in or near thunderstorms. Therefore, our weather force support element (WFSE), which is a part of the commander in chief's (CINC) air operations center (AOC), is tasked to forecast storm paths and trigger or intensify

thunderstorm cells over critical target areas that the enemy must defend with their aircraft. Since our aircraft in 2025 have all-weather capability, the thunderstorm threat is minimal to our forces, and we can effectively and decisively control the sky over the target.

The WFSE has the necessary sensor and communication capabilities to observe, detect, and act on weather-modification requirements to support US military objectives. These capabilities are part of an advanced battle area system that supports the war-fighting CINC. In our scenario, the CINC tasks the WFSE to conduct storm intensification and concealment operations. The WFSE models the atmospheric conditions to forecast, with 90 percent confidence, the likelihood of successful modification using airborne cloud generation and seeding.

In 2025, uninhabited aerospace vehicles (UAV) are routinely used for weather-modification operations. By cross-referencing desired attack times with wind and thunderstorm forecasts and the SPOT satellite's projected orbit, the WFSE generates mission profiles for each UAV. The WFSE guides each UAV using near-real-time information from a networked sensor array.

Prior to the attack, which is coordinated with forecasted weather conditions, the UAVs begin cloud generation and seeding operations. UAVs disperse a cirrus shield to deny enemy visual and infrared (IR) surveillance. Simultaneously, microwave heaters create localized scintillation to disrupt active sensing via synthetic aperture radar (SAR) systems such as the commercially available Canadian search and rescue satellite-aided tracking (SARSAT) that will be widely available in 2025. Other cloud seeding operations cause a developing thunderstorm to intensify over the target, severely limiting the enemy's capability to defend. The WFSE monitors the entire operation in real-time and notes the successful completion of another very important but routine weather-modification mission.

This scenario may seem far-fetched, but by 2025 it is within the realm of possibility. The next chapter explores the reasons for weather-modification, defines the scope, and examines trends that will make it possible in the next 30 years.

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