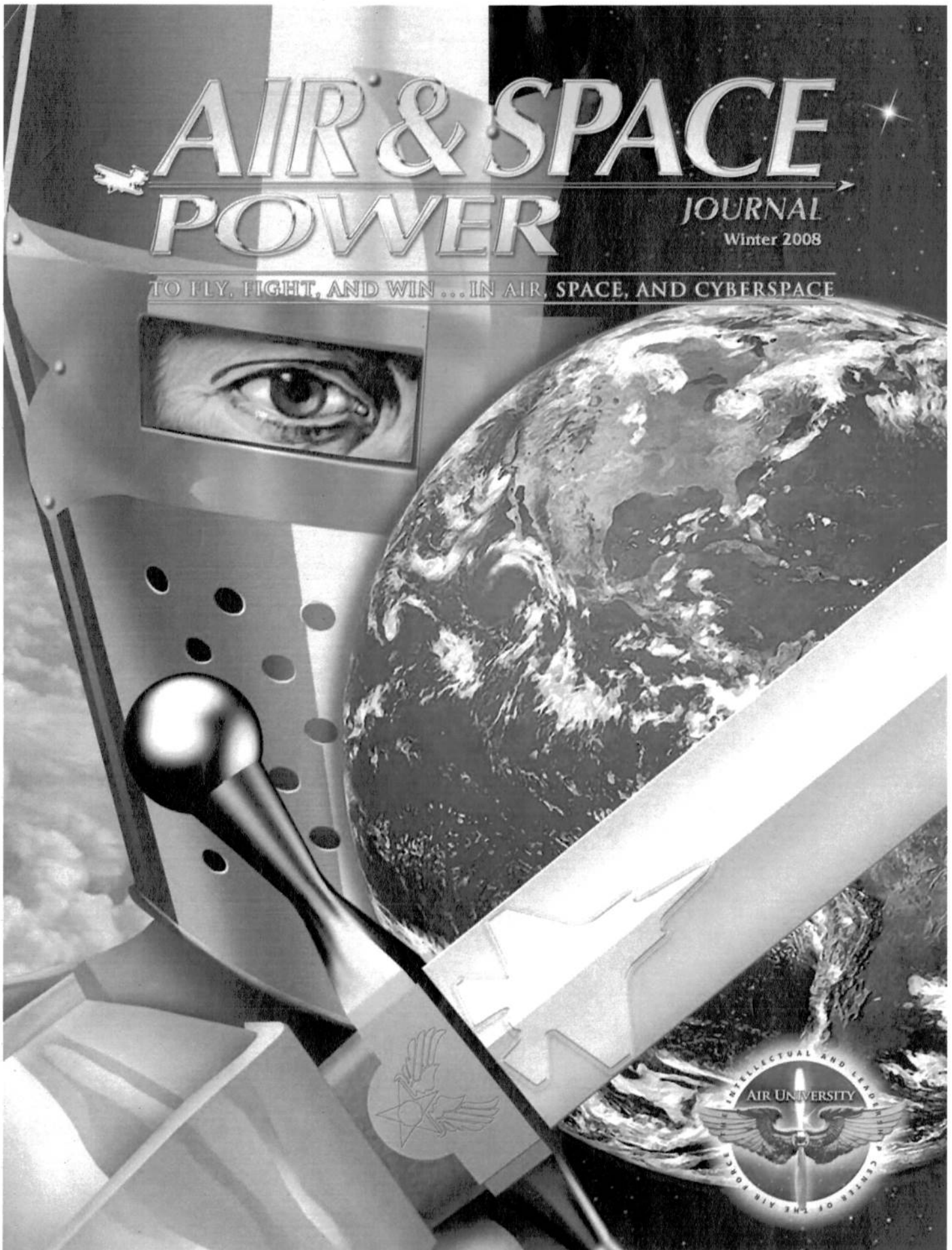


# AIR & SPACE POWER

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TO FLY, FIGHT, AND WIN ... IN AIR, SPACE, AND CYBERSPACE



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**Senior Leader Perspective**

- Lichte on Leadership: A Yankees Fan's Perspective* ..... 5  
Gen Arthur J. Lichte, USAF

**Focus Area**

- Global Vigilance, Reach, and Power* ..... 12  
Lt Col Paul D. Berg, USAF, Chief, Professional Journals

**Features**

- Defense of US Space Assets: A Legal Perspective* ..... 75  
Capt Adam E. Frey, USAF
- Shifting the Air Force's Support Ideology to Exploit Combined Arms in the Close Fight* ..... 85  
Lt Col Collin T. Ireton, USAF
- Why We Should End the Aviator Continuation Pay Bonus Program* ..... 95  
Maj Brian E. A. Maue, USAF

**Departments****Prelaunch Notes**

- Honoring Maj Gen I. B. Holley for His Many Years of Service to Air and Space Power Journal* ..... 13

**Ricochets and Replies**

- ..... 14

**The Merge**

- Reply to "A Look down the Slippery Slope: Domestic Operations, Outsourcing, and the Erosion of Military Culture"* ..... 17  
John R. Leibrock
- Comments on "Weather and the Calculated Risk"* ..... 19  
Col Bob Glahn, USAF, Retired
- Reply to "Military Transformation: Ends, Ways, and Means"* ..... 21  
Mr. Benoît Drion
- An Airman's View of United States Air Force Airpower* ..... 23  
Dr. Stephen E. Wright, Colonel, USAF, Retired
- Asking the Right Questions* ..... 31  
Capt David Blair, USAF
- Asymmetric Air Support* ..... 34  
Maj Gary L. Burg, USAF
- Human Performance Enhancement: Überhumans or Ethical Morass?* ..... 39  
Col Lex Brown, USAF, MC, SFS  
Lt Col Anthony P. Tvaryanas, USAF, MC, SFS
- Air-Mindedness* ..... 44  
Dr. Dale L. Hayden

# Comments on “Weather and the Calculated Risk”

COL BOB GLAHN, USAF, RETIRED\*

I WAS VERY PLEASED to see Maj Anthony Eckel, Capt Jeffrey Cunningham, and Maj Dale Hetke’s article “Weather and the Calculated Risk: Exploiting Forecast Uncertainty for Operational Risk Management” (*Air and Space Power Journal*, Spring 2008). I am a strong proponent of probability forecasting, mainly for the reasons given in that article. Most decisions are based on incomplete information, and a great many depend on weather. If we can quantify the uncertainties and know the risks, we can base decisions on decision theory concepts.

Probability forecasting is not new. Cleveland Abbe, who helped establish the Weather Bureau (now the National Weather Service [NWS]), was called “Old Probabilities.” Decision theory was also known early on, and I published “The Use of Decision Theory in Meteorology with an Application to Aviation Weather” in *Monthly Weather Review* in 1964. The Weather Bureau established a national program of forecasting the probability of precipitation in 1966. Unfortunately, progress in probability forecasting has been excruciatingly slow.

However, there is now renewed interest in probability forecasting. The National Research Council recently issued a report on the topic, *Completing the Forecast: Characterizing and Communicating Uncertainty for Better Decisions Using Weather and Climate Forecasts*, that was sponsored by the NWS.<sup>1</sup> Partly in response to that report, the American Meteorological Society has established an Ad Hoc Committee on Uncertainty in Forecasts. Many scientists from various walks of life are participating to help identify better ways of addressing forecast-uncertainty

products, services, and the nation’s information needs.

The increased interest has been fostered by the computer power now available to address uncertainty in the numerical weather-prediction process. Ensembles of model runs exhibit the uncertainty attributed to incompletely known initial conditions and inadequately modeled atmospheric processes. These ensembles produce a distribution of weather variables of interest. Characteristically, however, the ensembles are underdispersed; that is, they do not cover the full range of possibilities. For probabilistic forecasts to be useful in formal decision processes, they must be reliable. That is, if the probability of an event is forecast to be 20 percent on many occasions, then the event should occur on about 20 percent of those occasions. If that is not true and the user has no way to make them reliable, then the use of the probabilities may do more harm than good.<sup>2</sup> Even though the ensembles do not produce reliable probabilities, their output can be post-processed statistically to provide reliable and more skillful forecasts. Such postprocessed forecasts from the NWS’s Global Forecast System will soon be in the National Digital Guidance Database, which is interoperable with the National Digital Forecast Database.<sup>3</sup>

The future is brighter than ever before since we can now make informed operational decisions by applying risk-management principles; however, as Eckel, Cunningham, and Hetke state, the shift to rigorous use of probability forecasts in decision models will not occur overnight. The process will be gradual, but we will make progress. □

*Silver Spring, Maryland*

\*The author is director of the Meteorological Development Laboratory, National Weather Service.

Notes

1. National Research Council, *Completing the Forecast: Characterizing and Communicating Uncertainty for Better Decisions Using Weather and Climate Forecasts* (Washington, DC: National Academies Press, 2006).

2. Allan H. Murphy, "The Value of Climatological, Categorical and Probabilistic Forecasts in the Cost-Loss Ratio Situation," *Monthly Weather Review* 105, no. 7 (July

1977): 803-16, <http://ams.allenpress.com/archive/1520-0493/105/7/pdf/i1520-0493-105-7-803.pdf>.

3. Harry R. Glahn and David P. Ruth, "The New Digital Forecast Database of the National Weather Service," *Bulletin of the American Meteorological Society* 84, no. 2 (February 2003):195-201, <http://ams.allenpress.com/archive/1520-0477/84/2/pdf/i1520-0477-84-2-195.pdf>.

## THE AIRMAN'S CREED

I AM AN AMERICAN AIRMAN. I AM A WARRIOR. I HAVE ANSWERED MY NATION'S CALL.

I AM AN AMERICAN AIRMAN. MY MISSION IS TO FLY, FIGHT, AND WIN. I AM FAITHFUL TO A PROUD HERITAGE, A TRADITION OF HONOR, AND A LEGACY OF VALOR.

I AM AN AMERICAN AIRMAN, GUARDIAN OF FREEDOM AND JUSTICE, MY NATION'S SWORD AND SHIELD, ITS SENTRY AND AVENGER. I DEFEND MY COUNTRY WITH MY LIFE.

I AM AN AMERICAN AIRMAN: WINGMAN, LEADER, WARRIOR. I WILL NEVER LEAVE AN AIRMAN BEHIND, I WILL NEVER FALTER, AND I WILL NOT FAIL.