

**THE CONSORTIUM OF ORGANIZATIONS FOR STRONG-MOTION  
OBSERVATIONS SYSTEMS (COSMOS)  
MISSION AND OBJECTIVES**

Bruce A. Bolt, President

**1. Introduction**

Many present will remember, and even have taken part in, the sequence of meetings, working groups, committees, and report writings over thirty or more years that were aimed at funding, strengthening, and consolidating the diverse strong-motion instrument systems in the earthquake vulnerable parts of the United States. There was therefore widespread satisfaction with the announcement in 1998 that a Consortium of Organizations for Strong-Motion Observation Systems (COSMOS) had been formed. The decisive initiative was a National Science Foundation Vision 2005 report written during a 1977 national workshop, chaired by J. Carl Stepp. This initiative went hand in hand with a statement (October 1997) on the future of the U.S. National Strong-Motion Program, under the auspices of the U.S. Geological Survey, prepared by a committee chaired by Roger Borchardt (*U.S.G.S. Open File Report 97-530B*).

A further auspicious alignment of interests took place with the preparation by the U.S. Geological Survey of a comprehensive review of seismic monitoring in the United States and the publication of "An Assessment of Seismic Monitoring in the United States: Requirement for an Advanced National Seismic System," (U.S.G.S., February 1999). This document went forward to the U.S. Congress with notable success. It dealt with all aspects of earthquake monitoring, including emergency response for volcanic eruptions, tsunamis, hazard assessment, and earthquake engineering. It considered seismographic observatories of the classical type, with sensitive seismographs providing continuous surveillance of earthquakes in the United States and around the world. But it also gave due weight to strong-motion monitoring systems with accelerometers, specifically designed to record the near-source ground motion associated with earthquakes greater than about magnitude 5. "An Assessment..." noted that strong-motion recordings provide "fundamental data for engineering design and construction practices and for seismic design criteria for building codes." It went on to state that "the primary data and results from the systems are records of strong shaking and empirical relationships, showing the attenuation of strong-ground shaking at increased distance from the source."

A part of the 1999 U.S. Geological Survey document was its brief history of the seismic monitoring networks in the United States. It noted that two distinct systems—for weak and strong motion—had developed in the country, growing out of differences in monitoring, research interests, and instrumentation. I would agree with this generalization, but remark that there have always overlaps, particularly at some seismological centers, among which I include the one I directed for almost thirty years at the University of California at Berkeley. In the UCB network, every attempt was made to operate a range of seismographs so that not only microscopic ground motions from remote earthquakes could be recorded, but also the very strong shaking near the source of even great earthquakes, such as the 1906 San Francisco earthquake.

In its assessment of the progress of the modernization of seismic networks, the U.S. Geological Survey report specifically mentioned COSMOS and its goal of providing a continuous link between the users of strong-motion data and organizations, both public and private and both state and federal, which operate strong-motion networks across the country. Its vision plan required combining and integrating seismographic monitoring on all scales, "with strong-motion recording and structural response monitoring focussed on urban areas of risk."

In a meeting in August 1999 in Colorado, called by Dr. John Filson for the U.S. Geological Survey, discussion took place on the report to Congress on the implementation plans for the Advanced National Seismic System. While the final report, stating the conclusions of this workshop is not yet to hand, they include an important role for COSMOS.

### 2. Purposes of COSMOS

Details on the mission and purposes of COSMOS are found in its Charter (attainable from the COSMOS office: COSMOS, c/o PEER, Bldg. 454, 1301 S. 46<sup>th</sup> Street, Richmond, California, 91804, and from the COSMOS web site, <http://www.cosmos-eq.org/>), which was adopted by professionals attending a meeting of the Stepp committee in Oakland, California, on 19 December 1997. Subsequently this Charter was endorsed by four core strong-motion systems operators: California Division of Mines and Geology, the U.S. Army Corps of Engineers, the U.S. Bureau of Reclamation, and the U.S. Geological Survey.

The COSMOS Charter sets out as a prime objective the reduction of the catastrophic effects of earthquakes in life and property, the protection of economic health, and public safety from future earthquakes. It mentions specifically:

- (1) the acquisition and dissemination of critical sets of *in situ* measurements of damaging ground shaking and the resultant response of the built environment;
- (2) the advancement of programs to acquire and disseminate the measurements, to develop adequate resources to acquire and disseminate rapidly strong-motion data, and to avoid missing infrequent earthquakes;
- (3) the rapid dissemination of strong-motion information through the optimum use of modern technologies, including a virtual data dissemination system of national and international extent;
- (4) the stimulation of the use of strong-motion data for design of new facilities and evaluation of existing facilities; and
- (5) the advancement of the use of strong-motion measurements and information for post-earthquake response and recovery.

The urgent need for all these objectives has been brought home with terrible emphasis in the recent, tragic and devastating Izmit earthquake in Turkey ( $M_w = 7.4$ , 8/17/99). In the shaken region, our Turkish colleagues and their collaborators operated systems of strong-motion instruments. Even in such an emergency, they were able to make accelerograms of the strong ground motions available in digital form on the World Wide Web in the days immediately following the disaster. These records will be invaluable in future studies of the seismic shaking that caused the destruction.

### 3. The Incorporation of COSMOS

As mentioned above, the seminal Charter of COSMOS was prepared in final form by the end of 1997. Subsequent meetings of interested parties took place, which led to the decision in early 1999 at the Annual Meeting at the Earthquake Engineering Research Institute in San Diego, California, to set up a nonprofit public-interest corporation in the State of California, which would adopt the Charter and carry out its mandates. The need for such an independent, private corporation had emerged as essential after discussions of the ways in which funding could flow from members for support and expenses for COSMOS and its policy committees. In particular, the retention of an Executive Director, responsible for the development of the program, was believed to be essential; past efforts at integration often failed through weak administration and lack of coordination.

Consequently, in the first half of 1999, under an interim Board (President, Bruce A. Bolt, Secretary, William U. Savage, Treasurer, Chris D. Poland, and an Interim Executive Director, Carl Stepp) Bylaws were drawn up that meet California incorporation law and tax code, and are compatible with the Charter. In August 12, 1999, official confirmation of the Incorporation of the Consortium was received from the Secretary of State in Sacramento.

At the meeting tomorrow on 16 September 1999, COSMOS will have its inaugural General Meeting, with a much broader membership as here-for-too. The meeting has been advertised in brochures, on the World Wide Web (<http://www.cosmos-eq.org/>), and in the notification of the SMIP 99 meeting. It is expected that at that time a slate for the Board of Directors will be put before the members present; the Board of Directors will then elect officers according to the Bylaws of the Corporation. At the same time, some key committees, as foreshadowed by the Charter, will be put into place. These include the election of a Strong-Motion Program Board (SMPB) and a Senior Advisory Council (SAC). It is to be hoped that members present at the 15 September 1999 meeting of SMIP 99 interested in the future enhanced effectiveness of strong-motion systems in the United States will attend the General Meeting.

As this interim period comes to an end, a number of organizations must be thanked for grassroots support that enabled the organization to be established. First is the Pacific Earthquake Engineering Research Center (PEER), particularly Jack Moehle, Director, where COSMOS has an office. Secondly, we have had crucial financial support from contracts with the California Strong-Motion Instrumentation Program and with the U.S. Geological Survey, Roger Borchardt helped in critical ways, as did Grant Lindley in setting up the World Wide Web for COSMOS. We have been given a computer system by the Bureau of Reclamation and financial grants from Pacific Gas & Electric Co., Degenkolb Engineers, and Kinometrics, Inc. At the meeting at PEER on 16 September, members will be asked to confirm a fee schedule for differing categories of membership in order to maintain the Consortium as an active partner in meeting the challenge of earthquake loss reduction in the U.S. over future years. The help of everyone present here and of the organizations many of you represent is earnestly solicited.

### 4. Future of COSMOS

## SMIP99 Seminar Proceedings

Even while COSMOS was being constructed, it has been active in a number of ways. There is clearly much to do and it will be a busy time in the year ahead. First and foremost will be policy contributions to the establishment of the Advanced National Seismic System after Congress appropriates funds to the U.S. Geological Survey. COSMOS representatives will take a significant place in the organizational structure of the National System.

COSMOS has already started on the development of a model for a virtual strong-motion data center for data dissemination through the Internet. The organization is grateful to Ralph Archuleta, Roger Borchardt, and Anthony Shakal for acting as a Working Committee on this project. In a few minutes, the meeting will hear about their findings.

Finally, COSMOS has been concerned even at this early stage with the definition of standards for the various networks that comprise the variety of systems of strong-motion accelerometers and associated instruments across the country. It has also taken preliminary steps to integrate the U.S. systems with those of our neighbors in the Americas and overseas.

I assure the membership that the present officers and those that emerge from the meeting tomorrow envisage a vigorous attack on the problems of strong-motion recording in the U.S. As the new millennium unfolds, we look forward to a much more effective national strong-motion program to serve the scientific, engineering, and emergency-response interests of the country.