

SURVEYING SUPPORT FOR EASTERN EUROPE

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BIOGRAPHICAL SKETCH

Charles Challstrom is Chief of the Space and Physical Geodesy Branch within the National Oceanic and Atmospheric Administration (NOAA), National Geodetic Survey (NGS). He manages the NGS space geodesy programs required for development and preservation of geodetic networks to support marine and airborne navigation, land surveying, engineering, and scientific programs. Mr. Challstrom received a B.A. degree in Mathematics from California State University, Fresno, in 1973, and a M.Sc. degree in Geodetic Science from The Ohio State University in 1982. He has served on the ACSM Board of Directors as Treasurer and as AAGS President, and is the incoming Auditor/Treasurer for the International Federation of Surveyors (FIG).

ABSTRACT

The U.S. Agency for International Development (A.I.D.) has relied on NOAA's technical advice and assistance with control network upgrades in Eastern European nations to facilitate divestiture of state-owned farms and establishment of geographic information systems (GIS). For Romania, NGS is participating with training, field demonstrations, and computational support intended to empower Romania with the Global Positioning System (GPS) tools and techniques to accelerate surveying and mapping necessary to develop their private land market. For Albania and the Slovak Republic, NGS has reviewed organizational capabilities and provided advice on technical issues associated with land reform policies. Through A.I.D., additional countries are requesting technical assistance with surveying and their spatial reference systems. This paper will:

- Summarize the NGS program to transfer GPS surveying capability to Romanian surveyors,
- Assess private sector surveying capability for Eastern European countries,
- Identify opportunities for U.S. professional organizations to assist with transferring technology, and
- Suggest mechanisms for involving the U.S. private sector as suppliers of surveying equipment and assistance in Eastern Europe.

BACKGROUND

Since 1989, the world has witnessed remarkable changes in Central and Eastern Europe with government upheavals and the emergence of democratic institutions. While such transitions are unanimously geared toward market-oriented systems, the path is strewn with challenges. While there may be broad consensus on general goals, issues associated with land reform are

complicated by differences in historical setting, economic variability, environmental problems, and power struggles. Land is the most basic commodity, and individual land ownership quickly becomes the cornerstone of rebuilding economic and political stability. Surveying plays a major role in establishing any system of land ownership. Recent advances in use of the Global Positioning System (GPS), when applied to a sufficiently accurate spatial reference system, can help meet the demands for land ownership in Eastern Europe.

Since July 1992, NGS has been assisting A.I.D. with technical advice and assistance for control network upgrades in Eastern European nations to facilitate divestiture of state-owned farms and establishment of GIS. NGS involvement thus far has included activities in Albania, Romania, and the Slovak Republic, but, based on priorities set by A.I.D., the majority of our Eastern European effort has been focussed on Romania.

U.S. ASSISTANCE TO ROMANIA

The United States committed to a \$10 million package to assist Romania with its land reform program. The initial \$8.5 million portion of that package was channeled by A.I.D. through the International Fertilizer Development Center of Muscle Shoals, Alabama, to generate Romanian funds to purchase needed surveying and mapping equipment. The remaining \$1.5 million funds an Inter-Agency Agreement between A.I.D. and NGS to provide assistance to the Government of Romania for implementation of GPS surveys to accelerate land parcel surveys and the transfer of Romanian land to private ownership.

Inter-Agency Agreement

Prior to finalizing the Agreement between A.I.D. and NGS, it was necessary for the Romanian Parliament and Prime Minister to approve the declassification of seven primary geodetic control points for use by NGS. All other high-order control points within Romania remain under the exclusive purview of Romania's Military Topographic Department. There is legislation pending within the Romanian Parliament to ultimately restructure cadastral surveying responsibilities and open up the entire control network for civilian use. The Agreement for NGS assistance to the Romanian Ministry of Agriculture includes the following action items.

1. Provide GPS Training in United States. NGS trained four Romanian Government employees in GPS project management, reconnaissance, survey techniques, and data processing and analysis for the positioning of survey control points and land parcel corners. One of these participants is serving as the Romanian GPS Project Manager. The objective is to establish GPS core capability with Romanian personnel which will be available to train others in the application of GPS technology.

The Romanians were trained at NGS headquarters in Silver Spring, Maryland, and at NGS mobile geodetic field parties in the United States. The first 2 weeks at NGS headquarters concentrated on project planning, reconnaissance requirements, and project management. After attending the Urban and Regional Information Systems Association 32nd Annual Conference in Milwaukee, Wisconsin, the next 4 weeks with NGS field parties included

extensive field training on GPS survey operations and field data analysis. The last 5 weeks were spent learning GPS data processing and datum transformations.

2. Supply 15 Geodetic GPS Receivers. NGS furnished 15 geodetic GPS receivers to be used in this project and for the continuing task of positioning of block and parcel corners. In addition, NGS furnished computers, software, tripods, and other auxiliary equipment necessary to process the data collected.

3. Assist with Implementation of GPS Surveys. Eight U.S. Government employees [six from NGS and two from Bureau of Land Management (BLM)] traveled to Romania for 4 weeks in September/October 1994 to assist Romania with implementation of GPS surveying capability. First, reconnaissance and site preparation were performed at the seven primary Romanian survey points. Next, the seven points were observed with GPS by joint Romanian-American survey crews. Until declassification of the geodetic grid in Romania, surveys for any network densification will be responsibility of the Romanian Government surveyors. However block and parcel surveys can proceed based on the seven primary points.

4. Conduct GPS Processing and Training in Romania. One NGS employee remained in Romania for 2 additional weeks for project coordination. The NGS employee continued to train the Romanians as they processed and analyzed data.

5. Conduct GPS Seminars in Romania. Four NGS employees will conduct a total of six seminars in Romania to train two surveyors from each judet (district) in GPS data collection and field analysis. Each seminar will be 5 days long and will give students the opportunity to have hands-on GPS observation and processing training. Computers and training equipment will be supplied for this training.

6. Assist in Implementing GPS Photogrammetry. NGS is working with World Bank and European Union support programs to develop a comprehensive, state-of-the-art, photogrammetric capability for Romania. This planning should include a complete system capability, from aircraft to GIS.

7. Sponsor a Technical Conference in Romania. NGS is assisting in the planning and coordination for a technical conference to be held in Bucharest, Romania, in Fall 1995. Experts in geodesy, geophysics and related fields will be invited, primarily from Eastern European countries. This conference will provide an opportunity to showcase the success of this project as well as the technology available from U.S. equipment and service providers.

Survey of Primary Points in Romania

Survey Operations. After selection of the seven primary points by the Romanian Government, planning and reconnaissance was carried out jointly with NGS and Romanian personnel. With excellent cooperation from NOAA procurement offices, 15 GPS receivers, 10 notebook computers, and an extensive array of surveying support equipment were procured just in time for shipment to Romania--in 101 boxes!

The GPS observations on the seven primary points by the Romanian-American survey crews went extremely well. Although widely dispersed across Romania (a country the size of the State of Oregon), survey operations were successful, and 4 days of 24-hour observations were collected on each of the seven points. The data was then returned to NGS in Maryland for vector reduction and analysis, also with the assistance of Romanian personnel.

Connection to EUREF. Through cooperation with the Institute for Applied Geodesy in Germany, GPS observation data was obtained from other European geodetic stations occupied simultaneously with the seven stations in Romania. By processing all these observations together, NGS has computed GPS vectors to tie the Romanian stations into the European Reference (EUREF) system. This action will ensure that further work can be compatible with the EUREF accuracy and increase the cooperation for applications that extend beyond national borders, e.g. aircraft navigation, crustal motion and geophysical studies.

Advice on Land Records Management

As part of providing GPS-implementation assistance to Romania, NGS and BLM have been cooperating to assess the Romanian systems for management of lands records. This has included a review of land titling processes and the role of local lands commissions. The involvement of two BLM employees with these latest GPS surveys provided a second opportunity for BLM to visit judet land records offices and to prepare a set of recommendations focussed on improving land records management. These recommendations are being shared with A.I.D., the Romanian Government, and other European support organizations.

PRIVATIZATION OF SURVEYING

To date, I have been involved with assessments of the private surveying sector in Romania and the Slovak Republic, and these assessments were completed for A.I.D. in conjunction with BLM employees (Abrams 1993, Abrams 1994). The private sector situations are different in these two countries, but a demonstration of contracting would be a major stimulus for developing a private surveying sector in both.

To implement such improvement, expanded cooperation of the internal, national surveying organizations is necessary to ensure eventual success. Throughout this part of the world, there remains some element of military or centralized government responsibility for surveying and mapping that can hinder private sector development. Most outside support programs are supplying governmental offices with additional equipment, and thus empowering the government to tackle short-term needs. For longer term stability and widespread implementation of surveying and mapping technologies to benefit a larger segment of Eastern European society, there must be incentives to involve the private sector as well.

Increased external cooperation and follow-through is also required, with this emphasis on long-term development of the private sector. There have been significant promises, but limited delivery, of outside surveying and mapping support. These promises developed from assessments conducted for the European Community/European Union PHARE program, the

World Bank, and A.I.D. There is some skepticism within the region caused by delays in delivery of promised support. The optimism of political and social change has come up against the walls of bureaucracy of the outside support organizations. All participants seem aware of this dilemma, but still the problems linger, slowing forward progress and wasting needed resources.

Privatization in Romania

Private Firms. There are few private surveying businesses in Romania. Our discussions indicated possibly ten or twenty firms (Abrams 1993) and this has been confirmed by others (Leatherdale 1993, IFDC 1993). Many of these businesses are quasi-private, meaning government surveyors working part-time in the private sector, perhaps using government-owned equipment. With one or two exceptions, the truly private firms are very undercapitalized with limited ability to take on a government surveying contract of any magnitude. This obstacle can be overcome with up-front funding, allowing a contractor to procure necessary equipment and personnel.

Local Land Commissions. Another large obstacle to survey contracting in Romania is the adjudicative role of the local village land commissions. Their arbitative role in determining parcel ownership would make the determination of a Scope of Work virtually impossible due to the ever evolving political makeup of the local commissions. This obstacle requires some further study, and a focussed effort at three regional demonstration centers in Romania would determine which phase of the land privatization system could be successfully contracted (Abrams 1993).

Equipment Supplied. To date, 250 Zeiss Total Stations have been supplied by the PHARE program to the Romanian Government, with training, computers, plotters, digitizers, and software in a package valued over \$5 million (ILIS 1992, IFDC 1993). Despite initial problems with system incompatibilities, this equipment has already enabled some improvements in surveying for determination of block corners. The most recent addition of the 15 GPS receivers from NGS, together with improved accuracy from tying the seven primary stations to EUREF, will permit increased productivity. The combination of GPS, Total Stations, and other classical equipment, could be used in a multi-layered approach to tie all block corners with GPS, and then densify down to the parcel corners with classical equipment.

More Computers, Plotters, Etc. Needed. The judet offices suffer from a lack of data processing capability. Typically, there is a 386 and/or a 486-based computer, but software is lacking. Plotters suffer from dried-out pens and paper is of poor quality, if there is any. There is an impressive effort in some judets to implement improvements. Various lists of additional equipment have been reviewed for more than a year by outside support organizations, including A.I.D., but the equipment has yet to be procured. This problem needs a high level of attention.

Vehicles Needed. In addition to computing support, the judet offices lack the necessary vehicles to allow productive surveying. This vehicle problem has been identified repeatedly as a critical need for Romanian survey operations (IFDC 1993, Abrams 1993). To date, A.I.D.

has not approved the support for necessary vehicles because they are not made in the United States, and this offshore procurement needs a policy determination. Reluctance within the United States to fund the purchase of vehicles has held up an entire package of support items that should have included computers and vehicles. The U.S. support originated with \$8.5 million obtained in 1993 from the procurement, importation, and auctioning of animal feed supplement in Romania (IFDC 1993). After the auction, the funds were deposited in Romanian currency in a Romanian bank awaiting A.I.D. approval of the equipment procurement. Because of the time delay and declining value of the Romanian currency, the remaining amount is worth \$3 million or less in U.S. currency. Vehicles must be procured to enable the fullest potential use of the Total Stations and GPS equipment.

Privatization in Slovak Republic

Private Firms. The Slovak private sector includes an estimated 2,000 professional surveyors and technicians, approximately half employed in share-holding companies and half in small private firms (two or three surveyors). Much of the private sector work appears to be related to construction, but there is also a significant level of private sector surveying activity for the subdivision of land parcels.

Private Expertise. It is estimated that 50% of the private surveyors in the Slovak Republic are university educated, an impressive statistic. While we found a much more significant private sector than in Romania, the common elements are the needs to expand the surveyors' experience levels, empower the private sector with needed equipment, and encourage expanded use of the private sector for parcel surveys.

Land Market Opportunities. The privatization of the surveying sector is linked with privatization efforts within other sectors of the Slovak economy. In particular, with an emphasis on implementing a private land market, a major role for the private surveyors is dependent on privatization of Slovak agriculture. Since the "Velvet Revolution" in 1989, two separate processes have been underway in the Slovak Republic--the privatization of land and the privatization of the farms (Brunovský 1994). At this time, surveying and mapping issues are not yet hindering the Slovak agricultural cadastre (Abrams 1994). The priorities for surveying and mapping activities fall behind owner identification activities, in part because it is not yet legal to use land as collateral in financing arrangements.

When a functioning land market is established in the Slovak Republic, there will be increased concern for the accuracy of parcel identification and delineation. The U.S. mortgage banking system, with financial institutions requiring parcel surveys, provides an illustrative model of increased surveying requirements. These surveying requirements will add to current opportunities of the private sector for parcel subdivision surveys, and the responsibilities of the cadastral offices for approving boundary surveys and for adjudicating survey disputes.

OPPORTUNITIES FOR U.S. PROFESSIONAL ORGANIZATIONS

Professional associations, such as the American Congress on Surveying and Mapping (ACSM), can play a role in providing linkages for the promotion of contracting and the transfer of technology to Eastern European surveyors.

ACSM Publications

The model surveying contracts compiled by ACSM, as well as other publications that deal with legal and liability issues, can assist our counterparts in Eastern Europe with identification of pertinent issues. Defining contractual relationships between the governmental and private sectors is often a new concept in these countries. The specific guidance on surveying and mapping provided in the ACSM publications will aid national as well as local governmental offices. Although there may not be immediate contract opportunities, the ACSM publications should be shared in Romania with:

- Ministry of Agriculture;
- Institute of Geodesy, Photogrammetry, Cartography and Land Management; and
- Patronatul Na_ional Român (chamber of commerce equivalent)

and perhaps others dealing with general legal issues. Within the Slovak Republic, these publications should be shared with:

- Authority of Geodesy, Cartography, and Cadastre; and
- Slovakian Land Fund.

Working through the American Bar Association, it should be possible to identify other entities that would also be interested in the legal issues.

Cooperative Relationships

The transfer of surveying technology requires establishing mechanisms for sharing technical information and promoting the involvement of Eastern European surveyors in technical conferences. Within each country, there should be an organization representing individuals involved with our profession, and contacts should be developed. For instance, within Romania, the Union of Romanian Geodesy has been recently reactivated.

Working through the International Federation of Surveyors (FIG), ACSM can identify the appropriate organization and then foster a cooperative relationship. Various state affiliates of ACSM's National Society of Professional Surveyors may each want to sponsor a specific country's participation in FIG technical meetings when the United States hosts the FIG Bureau in 1999 through 2003.

INVOLVEMENT OF U.S. PRIVATE SECTOR

The involvement of foreign surveying individuals and organizations in technical conferences of ACSM and FIG will attract opportunities for the U.S. private sector in the international market. As these countries work to stabilize their political and economic situations, everyone recognizes the need to bring in the latest surveying and mapping technologies. Outside organizations providing financial support recognize the important role of the private sector.

NGS Contribution

NGS involvement in Romania resulted from our cooperation with states for accuracy upgrades of the existing geodetic control network throughout the United States. A.I.D. was enthusiastic about introducing GPS into Eastern Europe, and specifically using Romania as a prototype to demonstrate the potential of GPS for accelerating parcel surveys. NGS involvement was also motivated by the desire to demonstrate U.S. technology and ensure U.S. company participation in future surveying and mapping activities funded by international organizations.

Although these initial efforts were government-to-government, the magnitude of needs throughout the world dictates an increasing role for the private sector. NGS may continue to provide a yet-to-be-determined degree of limited technical oversight to A.I.D. for efforts in other countries.

U.S. Company Opportunities

U.S. companies must be provided information on opportunities to participate in the international market for providing surveying equipment and expertise. The following sources should be useful to the U.S. private sector.

Eastern Europe Business Information Center. Located within the U.S. Department of Commerce, International Trade Administration, this Information Center works with A.I.D. to help U.S. businesses locate partnership opportunities in the expanding Eastern European and Baltic markets. Further information is available by contacting the Center at:

U.S. Department of Commerce, Room 7412
Washington, DC 20230
tel: 202-482-2645

International Executive Service Corps. This organization provides coordination and funding for executives with a variety of opportunities. Their address is:

P. O. Box 10005
Stamford, CT 06904-2005
tel: 203-967-6000, fax: 203-324-2531

Volunteers in Overseas Cooperative Assistance. This organization is active in the region and is informed as to private sector opportunities. Their address is:

50 F Street, N.W.
Washington, DC 20001
tel: 202-626-8750

U.S. Trade and Development Agency (TDA). This agency has recently provided a technical assistance grant to conduct a study on the feasibility of developing an automated land cadastre and monitoring system for Russia. TDA may solicit future technical proposals from the private sector using the Commerce Business Daily. The TDA address is:

Room 309, SA-16
Washington, DC 20523-1602

tel: 703-875-4357

CONCLUSIONS

Working in cooperation with other Federal agencies and our international counterparts, NGS has participated in efforts to empower Eastern European surveyors with the latest tools for accurate surveying. Each of us involved with these cooperative efforts has felt tremendous personal satisfaction by participating in such important endeavors. For long-term stability in the region, each country's private surveying sector must be provided an opportunity to develop. Professional associations and the U.S. private surveying sector have significant roles in transferring technology to our colleagues in these emerging democracies.

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