THE
CARTER CENTER

Developing a Methodology for Observing Electronic Voting

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DEVELOPING A METHODOLOGY FOR OBSERVING ELECTRONIC VOTING

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Contents

INTRODUCTION AND BACKGROUND

The increasing use of new electronic voting (e-voting) technologies in elections around the world has been recognized by the international election observation community as one of the paramount challenges facing election observation today. As a whole, international election observation organizations have had relatively little experience observing elections in which e-voting technologies are used. In addition, the inherent lack of transparency of electronic voting technologies discourages easy observation.

E-voting systems thus pose important and unique challenges for election observers: How can observers assess the workings of electronic systems where the processes of vote counting and tabulation are often invisible? What aspects of traditional observation remain relevant for e-voting observation? What can and should be observed in the automated or e-voting systems? What are the critical and essential access points in e-voting processes that observers need in order to assess the integrity of the voting exercise? Does e-voting present new dynamics or challenges for the interrelationships between relevant stakeholders such as vendors, legislators, election officials, and others? Are there unique legal or legislative implications for e-voting systems?

To address some of these questions, The Carter Center has embarked on a two-year initiative aimed at developing an effective methodology for observing elections in which electronic voting technologies are used. On Nov. 2, 2006, The Carter Center hosted the first activity of this initiative—a small workshop of representatives of election observation organizations and e-voting experts aimed at fostering collaborative discussion and the development of a draft methodology for observing electronic voting. This meeting, called "Developing a Draft Methodology for Observing Electronic Voting Technologies," built

on the results of a previous workshop hosted by the Center in 2005 on the challenges posed by electronic voting technologies.

Shortly after the November 2006 meeting, The Carter Center deployed a specialized technical mission to Venezuela to observe the use of electronic voting in its Dec. 3, 2006, presidential election and to conduct a preliminary field test of the methodology. Following the Venezuela mission, Carter Center staff and consultants worked to update and revise the methodology. The Center plans to test the draft methodology in at least two additional pilot missions.

This short document, with the attached revised draft observation forms, summarizes the discussions of the November 2006 meeting, the methodological findings of the technical mission to Venezuela, and subsequent efforts by Carter Center staff to revise the draft methodology for observing electronic voting.[1]

SUMMARY OF NOVEMBER 2006 MEETING

Perspectives on Electronic Voting: Professor Douglas Jones

In advance of the November 2006 meeting, The Carter Center developed a draft methodology for review by meeting participants. This methodology served as the basis of discussion during the meeting. As an introduction and overview to the topic of electronic voting technologies, professor Doug Jones of the University of Iowa opened the meeting with a short presentation on the ways in which different perspectives on the use of electoral technologies can help to identify openings and opportunities for more meaningful observations.[2] According to Dr. Jones, it is helpful to understand the path of the voting machine through several cycles—the election cycle, the life cycle of the machine itself, and the cycle of data flow

1 This report was written by Avery Davis-Roberts, program associate in the Carter Center's Democracy Program.

2 http://www.cs.uiowa.edu/~jones/

between different equipment and software and different physical locations. The next several sections summarize the main points of Dr. Jones' presentation and the discussion among meeting participants.

Election Cycle

Pre-election tests and audits are an optimal opportunity for international election observers to assess not only the functioning of the electronic voting system but also the access of key stakeholders to the electoral process, including the technologies in use. However, when considering the election cycle, there are various factors that limit the extent and effectiveness of pre-testing and auditing of the electronic voting system.

First, there is often political pressure to extend the candidate registration period. If candidates are allowed to register at a later date, the period between candidate registration and election day may not be long enough to conduct the proper audits and tests. Shorter testing periods translate into shorter periods for correcting any detected errors or flaws in the electronic voting system, which can result in serious problems that must be resolved in an unrealistically short period of time.

A second important factor is the location and chain of custody of machines throughout the election cycle. Election observers should pay particular attention to the chain of custody of the machines, especially once they have been distributed from the central warehouse, where testing likely takes place, to the polling places. Once the machines are deployed to the polling places, physical security measures become paramount as transportation and in-polling-place storage provide a significant opportunity for tampering to take place. Because testing of the machines does not usually occur once the machines are distributed to the polling place, observing the chain of custody becomes the most effective means of ensuring that the equipment has not been tampered with or that any tampering that does occur is evident and that proper procedures are followed.

Third, after election day has concluded, voting information must be transmitted to the central tabulation system. The actual collection of the results from the voting machines usually involves the use of modems, memory sticks, and other electronic devices.

Depending on the electoral body, there may or may not be postelection audits that check the accuracy of the tabulated vote. These postelection audits would ideally occur before the official results have been announced and would be another opportunity for election observers to assess the efficacy and inclusiveness of the procedures in place.

Machine Life Cycle

The machine's life cycle begins with the invention of the voting equipment and ends when the machines are finally retired from use. Ideally, the first election employing a new voting technology will be a minor election with a low number of voters because there are almost always significant glitches associated with the first deployment of a technology.

Before the voting machines are used in an election, the electoral jurisdiction should assess whether the machine meets not only a set of recognized certification standards for electronic voting systems, but also the particular requirements of the election taking place and of the jurisdiction in which that election will occur. A jurisdiction may have different requirements for a voting machine depending on various factors, including whether the jurisdiction is rural or urban, the number of registered voters, and so forth.

Ideally, an independent body will be responsible for the certification of the technology and will determine whether or not the machine has met the standards set for e-voting technologies. In the United States, independent testing authorities (ITAs) perform this function. These laboratories are private companies that have been accredited by the U.S. Election Assistance Commission. However, the extent of a testing authority's actual independence is dependent to a large degree on the electoral body and the voting machine vendor. In the United States, for example, the ITAs often are paid to test the equipment and software by the voting machine vendor, potentially compromising the legitimacy of the certification process.

Observers should seek to answer the following questions when considering the certification process: What are the certification standards for a particular jurisdiction? Are these standards public information?

Is the process for certifying electronic voting systems transparent?

After the machine has been independently certified and accepted by the electoral body, the decision to deploy the technology can be made. At that point, election officials and poll workers must be trained to operate and use the machines. If the decision to deploy the technology is made too late, the amount of time available to test the machines, to properly train poll workers and election officials on their use, and to familiarize the electorate with the technology may be condensed to the detriment of the electoral process. Observation of the training of poll workers, election officials, and the electorate must be a central component of any e-voting observation methodology.

Cycle of Data Flow

When considering e-voting, observers should try and identify all the delivery paths of information between various software programs and equipment. Understanding the expected flow of information will help observers to identify potential opportunities for manipulation of the system and to assess whether adequate security procedures (both technical and physical) have been put in place. The cyclical flow of information and equipment between the vendor, the tabulation center, the warehouse, and the polling places requires that a certain level of security be implemented at each exchange of information to ensure that the system is, at least, tamper-evident. Figure 1 summarizes the cycle of data flow.

FIGURE 1: CYCLE OF DATA FLOW
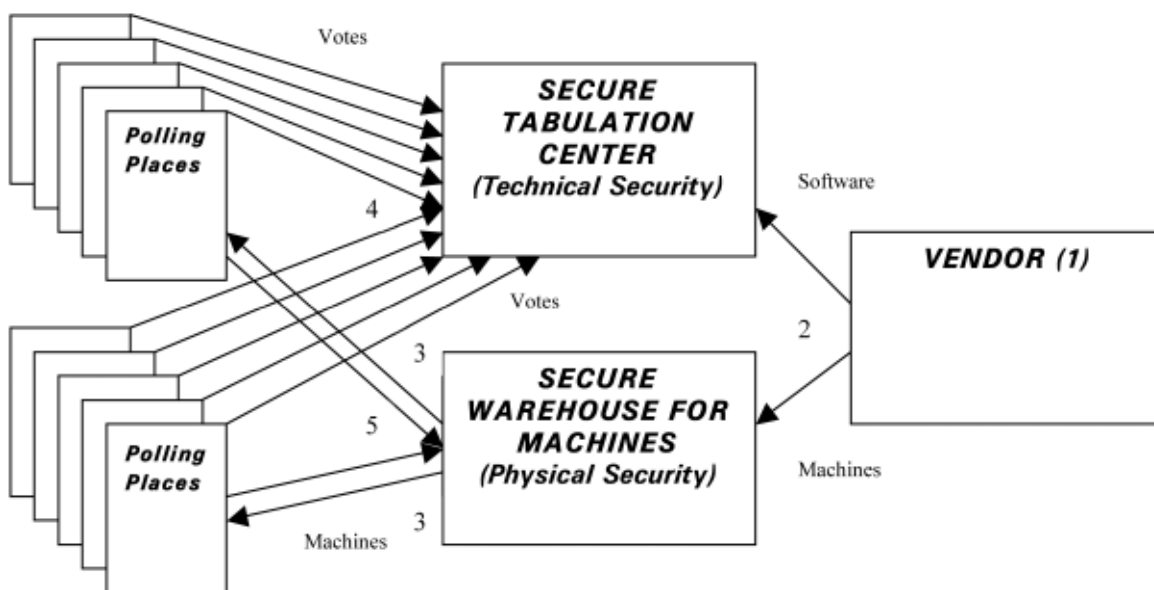
1. Vendor produces equipment and software.
2. Machines and software are delivered to the warehouse and tabulation centers—*data flow between vendor and tabulation center and warehouse*.
3. Machines are then deployed to polling places—*data flow between the polling place and the warehouse.*
4. On election day, votes are cast and then the election results are sent to the tabulation center—*data flow between the polling place and the tabulation center.*
5. After the election, the equipment is returned to the warehouse for storage—*data flow between the polling place and warehouse.*

There are two components for providing proper security during the various exchanges in the cycle: physical security and technical security. Physical security measures often include documented chains of custody to certify that each person involved in the process performed the proper protocol for the delivery and transfer of equipment and data. Technical security, on the other hand, usually involves cryptography to ensure that the software and the machines cannot be tampered with. The need for observers to focus exclusively on technical security measures generally occurs only if the physical security procedures have proven inadequate.

The methods used for transferring data from the polling centers to the tabulation center and for finally tabulating the votes can also present a significant challenge to observation and auditing. Most tabulation centers are set up with individual technicians sitting in front of computers, making it very difficult to observe the work that they are actually performing. The method for observing at the tabulation center must be fundamentally different from the way that the rest of the electoral process is observed.

International Standards for Electronic Voting

During discussion at the November 2006 meeting, there was general agreement among the participants that consideration of the legal framework is an especially important aspect of observing electronic voting and that the right of key stakeholders to have access to complaints procedures and other effective legal remedies becomes even more critical when new technologies are introduced. Several participants suggested that developing international standards for electronic voting technologies could give observers the tools necessary to assess both the legal framework of a particular country's elections and the electronic voting system. The Council of Europe's Standards for Electronic Voting Systems are one example of international standards.[3]

It was suggested that by working toward more harmonized methodologies for observing electronic voting, the election observation community is helping to articulate standards for e-voting based on widely accepted democratic principles, such as transparency and accountability. The Council of Europe recommendations go a step further and begin to tie those emerging standards to international law.

More generally, members of the group questioned whether electronic voting could ever be completely observable. Proprietary issues and nondisclosure agreements between the vendor and the electoral body can add to the opacity of electronic voting systems.

Technical Expertise

Meeting participants agreed that there is a general shortage of people, in both developing and developed countries, who have the technical expertise not only to observe all aspects of the electronic voting process but also to work with electoral commissions to adequately administer electronic elections. A few members of the group suggested that the gap between the knowledge of the technicians who run the election and that of the electorate could become so wide as to make the processes of electronic voting completely opaque to observation. In such circumstances, the ability of the general public to lodge complaints or legal challenges would be severely eroded. Similarly, political parties also suffer from a lack of technical capacity to observe electronic voting. There was a general consensus that political parties should be trained to observe electronic voting; one concrete suggestion for a next step was the creation of training programs for political party agents and other key stakeholders on voting technology.

3 http://www.coe.int/t/e/integrated%5Fprojects/democracy/
  02%5FActivities/02%5Fe%2Dvoting/

THE METHODOLOGY

P rior to the November 2006 meeting, The Carter Center developed a draft methodology for observing the use of electronic voting technologies. This draft methodology served as the basis for discussion during the workshop. As outlined above, the principal activities of the Center's two-year initiative on e-voting include a series of collaborative workshops and meetings, and pilot missions in collaboration with representatives of other observation groups, aimed at refining the methodology and increasing the hands-on experience of international observers with electronic voting. The following section provides an overview of the methodology and highlights the guiding principles that were identified during the November 2006 meeting discussions.

In electronic voting processes, observers are faced with trying to verify election processes that are at times opaque or occurring within a so-called black box. Observation of electronic voting technologies must, first and foremost, be concerned with assessing whether electronic voting technologies uphold international standards for democratic elections, such as the secrecy of the ballot and the right of the voters to participate in government. Recognizing that election day observation alone does not permit a complete assessment of whether these rights are being fulfilled, the Carter Center methodology takes a broader approach to the observation of electronic voting.

As with traditional election observation, observation of electronic voting must begin well in advance of election day and should consider the broader electoral context, such as the legal framework for the elections, voter education, poll worker training, political campaigns, and so forth, as well as the events of election day. Furthermore, because many tests, audits, and preparations of the electronic voting equipment take place months in advance of election day, observation of electronic voting requires additional emphasis on long-term observation and documentary research.

The use of electronic voting technologies also widens the scope of focus for observers in that it introduces new stakeholders into the electoral process, such as certification bodies and vendors. To understand the impact of technologies on the quality and conduct of the elections, observers must consider new types of information that would not necessarily have been included in traditional observation approaches, such as the contractual relationship between the election management body and the vendor.

In order to develop a standard methodology that can be applied in a wide variety of circumstances and to a variety of technical solutions, the Carter Center's draft e-voting observation methodology aims to identify key issues and questions to be assessed. The draft methodology includes generic template forms that allow the methodology to be used in a number of different countries and on different voting systems. The Carter Center, in creating the draft methodology, has tried to respond to all of the previously mentioned challenges and will continue to refine and improve it as we gain a better understanding of the intricacies of these challenges.

The draft methodology is based on two principal observation instruments: a baseline survey and observation checklists:

- **Baseline survey:** to be completed, to the extent possible, in advance of the audits, tests, and election day (see Appendix A)

- **Observation checklists:** to be completed based on observations during the immediate electoral period—four to six months around election day (see Appendices B–D)

The next two sections provide a detailed overview of the baseline survey, which is broken into eight issue areas, and the observation checklists. This is followed by a summary of the Carter Center observation mission to Venezuela.

The Baseline Survey

The baseline survey used in the Carter Center draft methodology contains 144 questions intended to guide the observation and assessment of the user. The information gathered by answering these questions, based on interviews with stakeholders and the review of legislation, rules, regulations, and other pertinent documentation, should help the observation team create a comprehensive picture of the voting system in use and how it should work and thus allow a more complete assessment. In this observation model, the baseline survey would be completed by long-term observers and core team members, such as the field office director and in-country staff, with assistance where necessary from technical experts in the months leading up to the election.

After collecting as much data as possible, the core team will produce a synopsis of the findings, providing an overview of the system that can be used by the team and by short-term observers. In addition, this information will be used to modify more generic election day and other checklists so that they become effective tools for capturing the observations of the team on how the system actually works in practice.

The baseline survey includes questions on eight general aspects of the electronic voting system: (1) the legal framework; (2) technology vendors and procurement of equipment; (3) certification, testing, and security of the system; (4) public confidence in electronic voting technologies; (5) voter accessibility; (6) election day procedures; (7) contingency planning; and (8) ballot counting, recount, and complaints procedures.

Legal Framework

As with any election, consideration of the legal framework regulating the electoral process is essential to a full understanding of it. A thorough review of the legal framework will help observers assess the degree to which the state has sought to provide not only clear and consistent rules and regulations for all aspects of e-voting and any reasonable eventuality that may arise from its use, but also the degree to which the state has taken clear steps to protect the internationally recognized rights of voters to cast a secret ballot, participate in their government, and have their vote counted as cast. In addition, review of the legal framework will help observers gauge the degree to which the election management body is taking active steps to promote transparency in the electoral process through mechanisms such as audits, impartial and independent certification, and testing.

In particular, Carter Center observers consider the roles and responsibilities of key stakeholders as outlined by law and focus specifically on the legally enforceable accountability of stakeholders—both traditional stakeholders such as election management bodies and nontraditional stakeholders such as certification bodies, vendors, and contractors. In addition, observers consider the degree of access granted by the legal framework to domestic observer groups and political party agents in addition to members of international observation delegations. While this is a critical aspect of observation of any election, the opacity of elections in which electronic voting technologies are used makes it critical that observers gain a sound understanding of these issues.

Technology Vendors and Procurement of Equipment

Electronic voting vendors and the systems they produce may be selected for a variety of reasons. Transparency and accountability in the tendering and procurement processes are critical to ensuring that the rights of voters are not undermined by private interests.

By asking the questions outlined in the Technology Vendors and Procurement of Equipment section of the baseline survey, observers will better understand the reasons why election management bodies have chosen to introduce electronic voting technologies, why they have chosen a specific technical solution, and how transparent the tendering process is. In addition, this section of the survey will guide observers in their consideration of the role of vendors in the electoral process, a role that in traditional elections may not be as important. In particular, Carter Center observers focus on the nature of the vendor's relation-

ship with the election management body and other key stakeholders to ensure that the relationship is free of conflicts of interest and that there was a competitive and transparent tendering process that resulted in the selection of a particular vendor to provide e-voting equipment and related services.

Certification, Testing, and Security of the System

The Certification, Testing, and Security of the System section of the baseline survey includes several critical issues that observers must consider to gain a sound understanding of the system, including voter verified paper trails and audits, certification, testing, physical security, software, integrity of the system, and ballot building.

Voter Verified Paper Trail and Audits

One widely accepted means of ensuring that the electronic voting system is recording votes as they were cast by voters is the use of a voter verified paper trail (VVPT). A VVPT allows a voter to cast a ballot electronically and then verify that the machine has accurately recorded the vote by checking a machine-produced paper receipt that captures the choice. This paper receipt should then be placed in a secure ballot box that protects the secrecy of the vote and can be manually recounted after the election. The results of the manual count can be compared to the electronic results produced by the machine (see the case of Venezuela, outlined in the next section of this report). Voters should not be able to remove the ballot paper or other proof of how they voted from the polling place.

Comparisons between the paper receipt count and the electronic results are useful for ensuring that the machine is accurately recording the voters' choices. If such comparisons are conducted on a statistical sample of machines, the sampling method must be clear and be consistently applied and follow sound statistical sampling practices to produce meaningful results that can be extrapolated to the universe of machines in use. In addition, observers should consider whether the results of the paper count can be used as the basis for a legal challenge to the election results.

Certification

Impartial, independent, and transparent system certification measures should be in place to ensure that the system meets national or international standards, the requirements of the election jurisdiction, as well as the technological specifications outlined by the vendor. International election observation missions should not be responsible for the certification or testing of an electronic voting system. Because this responsibility lies with election management bodies and the organizations with whom they work, Carter Center observers assess the functioning of the certification body and its relationship with other key stakeholders in the process, including the election management body, political parties, the vendor, and others. Questions included in this section of the baseline survey are intended to help capture data about the transparency, independence, and impartiality of the certification body and help observers understand any financial relationships that the certification body may have with the government, political parties, and others that fall outside the bounds of the contractual agreement between the certification body and the election management body. Observers also assess the degree of access granted to political party agents and observers, both international and domestic, in the certification process.

Testing

Electronic voting systems, including equipment and software, should be tested prior to the deployment of voting machines on election day to help ensure that the machines work as anticipated. This testing should be conducted in an impartial and transparent manner and should include all aspects of the system. Carter Center observers should gather information that will help assess the impartiality, independence, and comprehensiveness of the testing scheme in place.

Physical Security of the System

As in a traditional election, the physical security of election materials is an essential measure for protecting the integrity of the election, regardless of the technical solution used. Election management bodies should have clear processes and procedures in place

that regulate physical access to the equipment, document such access, and prevent physical tampering with the machines. Included in these processes should be mechanisms that allow any tampering to be evident (such as seals over data ports) and clear regulations outlining procedures to be followed if tampering is discovered. Voting materials, including electronic voting equipment and backup paper ballots, must be kept in a secure location at all times and should remain secure throughout transportation. Using the baseline survey and other forms, Carter Center observers collect information about the processes and procedures in place to regulate physical access to all electronic voting equipment and the central tabulating computers.

Software

The software used in electronic voting systems should be subject to impartial and transparent inspection. Inspection of the software by an independent body or by independent inspectors should be required by the election management bodies. Observers, both domestic and international, should have access to documentation detailing these inspections. Carter Center observers should collect data, through the baseline survey and other forms, to understand the nature of the software inspection, including who conducts the inspection, the conditions under which the inspection takes place, and what the inspection includes.

Ballot Building

The construction of electronic ballots is generally based on the creation of complex databases. The nature of this process introduces a high possibility of human error. Clear policies and procedures regarding the creation of electronic ballots, including institutional roles and responsibilities, are helpful. Ballots should be consistent in layout and design with any paper ballots that may be used.

Integrity of Data Transmission

The need to ensure the security of the system also extends to the transmission of the data from the voting machines in the polling place to the tabulating computers. Steps should be taken to effectively protect the transmission of data and prevent illegal access, or hacking. Observers should collect data that will help the observation mission assess the extent to which steps have been taken to protect the integrity of the data transmission.

Public Confidence in Electronic Voting Technologies

Allowing domestic observation groups, political party agents, and the public to have access to the electoral process, including those aspects that are automated, is a critical means of promoting public confidence. In addition, it is often helpful for electoral management bodies and legislators to include all stakeholders (e.g., civil society organizations, political parties, and voters) in the selection and introduction of new electoral technologies. This should include training for voters, political party agents, domestic observers, and others on the technologies, covering how to use them and how to assess indications of possible technology failure. Carter Center observers should assess the extent to which there is public debate about the use of electronic voting technologies, the degree of stakeholder participation in the automation of the electoral process, and, where possible, the steps taken to ensure that there is a high level of public comfort with the technologies in use.

Accessibility

To ensure that voters are not disenfranchised by the introduction of electronic voting technologies, election management bodies should take steps to check that all qualified voters are able to cast their ballots. This includes those who are disabled, illiterate, or do not speak the majority language of the country. Observers should consider the provisions in place to protect the right of these voters to cast ballots, including ballot design (e.g., in minority languages) or availability of ballots in larger type sizes, the availability of electronic voting machines for disabled voters, and any provisions to ensure that illiterate or disabled voters are able to cast and verify their votes.

Election Day Procedures

As in any election observation mission, it is important for observers to gain a comprehensive

understanding of procedures for elections in which electronic voting technologies are used, including voting processes. Electronic voting technologies should offer voters the same options as manual voting, including, but not limited to, casting blank ballots and cancelling their votes. If a voter verified paper trail (VVPT) is used, a voter should be able to cancel his or her vote should the paper receipt not reflect the ballot cast on the machine. Steps also should be taken by the electoral management body to ensure that the secrecy of the vote is protected, that a vote cannot be traced back to a specific voter, and that voters are not able to remove evidence of how they voted from the polling place.

Contingency Planning

Election management bodies should have clear and consistent rules in place in case of machine failure, whether resulting from power outages or other issues. These rules should be clearly communicated to all poll workers and technicians as well as observers and party agents, and poll workers should receive training on what to do in such instances. Any machine failures should be clearly documented. Documented chain-of-custody procedures should be in place to ensure that machines are secure from tampering once removed from the polling station either at the end of polling or in case of machine failure. Any replacement equipment should be subject to the same testing and certification processes as equipment initially installed in the polling place. International observers should assess the degree to which election management bodies have taken steps to ensure that contingency plans and procedures are clear to election officials and are implemented throughout the electoral process as well as what these plans and procedures are.

Ballot Counting and Recount and Complaint Procedures

The use of electronic voting technologies, particularly those that do not produce a VVPT, poses unique challenges to the observation of ballot counting. Regardless of whether the machines produce a VVPT, election results should be printed at the station level prior to transmission to the central tabulating computer, allowing the public and observers, at the very least, to conduct a comparative assessment of the results at the precinct level with the final official results. Specific procedures should be in place, and clearly conveyed to all stakeholders, for instances of discrepancies in the results, that is, when posted precinct-level results do not match final precinct results or when VVPT counts do not match the vote count produced by the machine. In addition, the grounds and procedures for a recount should be communicated to all stakeholders, including when a recount can be requested, who is responsible for the cost of the recount, whether the recount includes manually recounting paper ballot receipts and/or conducting a voting machine recount electronically, whether the results of a recount can be used as grounds for a legal challenge to the election results, and what constitutes the "ballot of record" in cases of discrepancy between electronic and paper results.

Observation Checklists

In addition to the baseline survey, the Carter Center e-voting observation methodology includes a number of checklists intended to capture the notes of short-term observers and guide informational interviews with vendors and other stakeholders. These checklists were constructed as a generic template so that they could be modified by the core team based on the data collected during baseline survey completion. This allows the checklists to be aimed at the specific qualities of the system in use in a country while providing broader guidance on content that could be applicable in a number of electoral contexts.

Ideally, questions included in these forms should be incorporated into election day checklists and should be aimed at the polling environment and broader electoral process. The Carter Center has developed generic template checklists for poll opening, voting, and poll closing, and will be creating forms for pre-election testing, auditing, and other critical events in the electronic election process.

Staffing Implications for an Election Observation Mission

The technical elements of electronic voting systems have critical implications for the composition of observer missions, which now must include members with specific technical skills. Members of the team should include:

• Technical experts, who will be included in the composition of the mission, either as longer term field staff or as consultants who can provide distance guidance to the short-term delegation and to long-term observers and core staff and be available to participate in pre- and postelection assessment missions.

• Long-term observers, working closely with technical experts, who will be responsible for gathering data based on the baseline survey. In addition to a sound understanding of the country's political climate, they will likely need a background in computer science or computer security. Long-term observers will be the backbone of the electronic voting observation mission.

• Short-term observers, who will remain an essential element of the electronic voting observation mission. While a technical background would be useful, and preferred, it is not necessary. Short-term observers will primarily be tasked with assessing the immediate pre- and postelection environment, election day events, and visually verifiable indicators of both the successful implementation of processes and procedures and the successful operation of the voting machines.

At the November 2006 meeting, some participants expressed concern that collecting and reviewing the data suggested by the baseline survey would require an unrealistic investment of time on the part of mission staff. Others, however, argued that the baseline is intended to be a flexible guide to observation and help ensure that observers try to collect relevant and adequate information to assess all key facets of the electronic voting system.

PILOT TEST: VENEZUELA PRESIDENTIAL ELECTION, DEC. 3, 2006

The work plan for the Carter Center initiative on e-voting includes three technical missions during 2006 through 2008. These missions are intended to provide an opportunity for The Carter Center to gain hands-on experience in observing electronic voting technologies and to field-test and refine the methodology over the course of successive missions. The Center's targeted mission to the Dec. 3, 2006, presidential election in Venezuela was the first such pilot mission. The November 2006 meeting served as a working preparatory session to review the draft methodology in advance of the Venezuela mission. Several meeting participants represented groups that planned to observe those elections. The meeting provided a valuable opportunity for interorganizational discussion about the technical challenges of observing electronic voting and the specific challenges of observing the Venezuelan election.

BACKGROUND

Venezuela provides a unique opportunity for developing and testing a methodology for the observation of electronic voting. It is considered by some to have one of the most technologically advanced electronic voting systems in the world with 99.5 percent of polling places in the country using electronic voting technologies. The current electronic system and other electoral technologies (such as the automated fingerprint identification system) had been the subject of controversy in previous elections, and so, while the breadth of coverage and sophistication of the electronic voting system presented a valuable opportunity for observation, the polarized political situation in the country and logistical difficulties of deploying observation missions relatively late in the audit process created a potentially difficult context for a technical mission.

Electronic voting technologies were first introduced in Venezuela in a series of pilot studies in the early 1990s. During the 1998 election, optical scan technologies, manufactured by the Nebraska-based ES&S company, replaced manual voting on a wide scale. These machines were in turn replaced by the Smartmatic touch-screen machines in time for the 2004 recall referendum. For the December 2006 presidential election, all of the machines used were Smartmatic touch-screen direct recording equipment.

SMARTMATIC MACHINE CONTROVERSY

Sources of controversy surrounding the Smartmatic machines in previous Venezuelan elections have included the bidirectional capabilities of the machines, the electronic voter lists (called polling books), and the use of fingerprinting machines:

- The voting machines transmit vote counts directly to the tabulation centers. The exchange of information from the machines to the tabulation centers has the potential to flow both from the machines to the tabulation centers and from the tabulation centers to the machines. This created concern among the opposition that the vote counts in the machine could be manipulated centrally on election day and then transmitted back to the polling stations without detection. In response to this concern, the National Electoral Council (CNE) agreed to keep the machines disconnected until voting closed at the polling stations during the 2006 election.

- In 2006, the CNE also agreed not to use the electronic polling books because of concerns that known opposition members might be deleted from the books or that the government would somehow adjust the lists in favor of the ruling party.

• While the CNE managed to address some of the opposition's concerns, doubts remained about the use of the automated fingerprint identification system (AFIS). In the past, the opposition suggested that the fingerprinting machines could compromise the secrecy of the vote and asked the CNE to withdraw them from use. The electoral body did not withdraw the AFIS machines from use during the election, arguing that they help prevent multiple voting. However, the AFIS machines were used only in polling stations serving 700 or more voters, and registration through them was not required for voters to cast their ballots.

Several of the participants at the November 2006 meeting agreed that the controversy over the electronic voting system in Venezuela resulted from popular misunderstandings of the electronic voting system and political campaigns that engendered, intentionally or not, concern among the electorate. The observer missions, including The Carter Center, the Organization of American States (OAS), and the European Union (EU), agreed to collaborate on the electronic voting component of the observation to dispel confusion and provide more accurate information in public reporting.

Audits

To help build confidence and security, the Smartmatic machines produce a voter verified paper trail and the CNE introduced an extensive audit scheme. The audit schedule included hardware and software audits before the election, an election night audit (commonly referred to as a "hot audit"), and paper slip audits during the postelection period. These audits began in October and continued through mid-December. Because the CNE issued relatively late invitations to international observers, many of these audits were already underway before the November 2006 Carter Center meeting and were completed by the time observers, including the Carter Center team, arrived in Venezuela in mid-November. Despite this, mission participants agreed that there was value in observing the remaining audits and that through post-hoc interviews and data collection,

missions would be able to assess the degree to which domestic observers, party agents, and the electorate were able to participate in the audit process and gauge their perception of the success of the audit scheme.

Hot Audit

The hot audit conducted for Venezuela's 2006 election included manually recounting the paper ballot receipts of 54 percent of the voting machines, a percentage far above what is normally required to conduct a statistically significant audit.[4] In light of Venezuela's contentious 2004 recall referendum and the opposition's boycott of the 2005 parliamentary elections, the primary purpose of the extensive 2006 hot audit appears to have been a confidence-building measure for the electorate. All of the parties participating in the Dec. 3 election supported the hot audit. OAS, EU, and Carter Center observers were in Venezuela on election day and were able to observe this audit as it took place.

Observer Access

The CNE repeatedly changed the audit schedule and released the regulations for both international and domestic observation very late in the process. Some members of the CNE suggested that the civil society group Sumáte should not participate in the domestic observation process because it is too closely tied to the opposition. Other groups such as Ojo Electoral (in conjunction with the National Democratic Institute) participated in the observation process.

Participants at the November 2006 Carter Center meeting agreed that international observers should draw attention to the fact that the regulations for international and domestic observers were released after the audits of the electronic system began, thus precluding the possibility that international and domestic observers would be able participate in the first audits. Similarly, the participants agreed that observers in Venezuela should note the general lack of clarity about what could be observed and by whom.

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4 Counterintuitively, the results of the paper receipt count were not compared against the electronic result printout from the electronic voting machines.

Another concern of the November 2006 meeting participants was the limited access to the source code that was provided to the non-CNE/Smartmatic technicians participating in the audits. In Venezuela, auditors were allowed to review the source code during CNE-controlled audit sessions and only could use a very limited number of diagnostic tools as part of the audit. Such restrictions, often the result of contractual agreements or nondisclosure agreements between the electoral body and the vendor, in which electoral bodies are prohibited from divulging technical details of the machines and the software that they use, can lead to a lack of confidence in the electronic system. In the case of Venezuela, Smartmatic has, in the past, been willing to share information with observers.

Electronic Hash Code

An important element of the Venezuelan Smartmatic electronic voting system was the use of the "electronic signature" or "hash file" as a tool to verify the source code and the programming that constitute the electronic system. The electronic signature was produced by an algorithm. If the programming of the machines changed, the algorithm would produce a different electronic signature, alerting the political parties to possible alterations in the software. At the end of the various audits, the political party representatives were given the electronic signature so that they could verify that the machines were not tampered with between the audits and deployment of the machines.

Participants at the November 2006 meeting discussed this security measure and concluded that it should not become a replacement for more stringent chain-of-custody procedures.

Piloting the Observation Methodology

Following the November 2006 meeting, The Carter Center revised several aspects of the draft methodology in time for use during the specialized, technical mission for the Dec. 3, 2006, presidential election in Venezuela. In accordance with the Declaration of Principles for International Election Observation, election observation missions may be either comprehensive missions intended to evaluate an electoral process in its entirety, or they may be specialized, limited missions to focus on particular aspects of the process. In the Venezuela case, the Carter Center mission focused solely on assessing the use of electronic voting technologies, but not in a comprehensive manner due to time constraints and the provisional nature of the methodological pilot test.

The mission to Venezuela was the first to use the Center's new methodology for observing electronic voting technologies. The mission began with the arrival of two technical experts in Caracas in late November who observed the audits that had yet to be completed. In addition, the technical experts gathered information to complete the baseline survey in advance of the arrival of a small, short-term team for election day. The collected data was used to create the election day observation checklists (poll opening, voting, and poll closing forms) that would be completed by the short-term teams.

Seven additional observers, including computer science and electronic voting specialists and Carter Center staff, joined the technical experts in Caracas two days before election day. After a series of briefings and meetings with electoral stakeholders including representatives of political parties, civil society organizations, other observer groups, and representatives of Smartmatic, five teams were deployed around Caracas on election day. After observing poll opening, voting, and poll closing, teams returned to the Carter Center office and were debriefed on their observations, including the draft methodology. The technical experts remained in Caracas to observe postelection audits.

See Box 1 for a synopsis of the final report of the 2006 Carter Center mission to Venezuela.

Box 1: The December 2006 Presidential Election in Venezuela

Excerpted from the Final Report of The Carter Center Technical Mission to the Dec. 3, 2006, Presidential Election in Venezuela

In response to an invitation from the Venezuelan National Electoral Council (Consejo Nacional Electoral or CNE), The Carter Center organized a specialized, technical mission to observe the use of automated voting technology in Venezuela employed in the Dec. 3, 2006, presidential election. The Carter Center technical mission had two main goals: (1) to demonstrate the support of the international community for democratic elections in the Bolivarian Republic of Venezuela and (2) to contribute to a larger project of The Carter Center to develop and update methodologies for observing and evaluating voting systems globally.

Carter Center observers arrived in Caracas on Nov. 22, 2006, after the completion of many of the pre-election audits. They were able to observe, however, a limited number of audits and tests in the two weeks prior to election day as well as election day and postelection audits. Given the late arrival of the mission, the direct observations of The Carter Center team were supplemented by analysis of the official minutes from those audits that took place prior to the team's arrival, information received from the CNE, and interviews with representatives of political parties and civil society organizations as well as with CNE personnel and Smartmatic staff.

Institutional Design and Political Context

According to the constitution and law, the administration, execution, and supervision of all electoral matters are the responsibility of the Poder Electoral, a fifth branch of government. For this reason, the Venezuelan electoral process is within the exclusive jurisdiction of an autonomous state authority. On one hand, this autonomy has facilitated the rapid and widespread adoption of electronic electoral technologies in Venezuela. On the other hand, in a context of high political polarization, the autonomy has contributed to concerns among the opposition about the integrity of the automated voting system as well as to perceptions of partisanship on the part of CNE directors appointed by a government-dominated legislature.

Venezuela first piloted electronic voting technologies in its 1993 elections and on a wide-scale basis in its 1998 elections. In 2004, direct electronic recording machines (DREs using touch-screen technology) were introduced with the intention to eventually achieve a totally automated voting system, including voter identification, vote casting, transmission and tallying, and candidate registration.

Before the 2006 elections, the CNE, in extensive consultation with opposition representatives, adopted a number of proposals to strengthen public confidence in the process, including (a) conducting a series of pre- and postelection audits, (b) conducting a hot audit of 54 percent of voting tables on election day, (c) disconnecting the voting machines during election day, and (d) printing out a record of votes cast in each machine before transmitting results.

The automated system has achieved a good level of technical performance. To ensure sustained public confidence in the system and to avoid the need for repeated ad hoc negotiations, we suggest incorporating many of the measures into standard regulations.

Design and Function of the Electronic Voting System

The Carter Center mission found the machines to be functioning correctly, which enabled voters to

cast their votes with little impediment. Nevertheless, some details related to the design of the machines were observed, such as confusion among voters regarding the paradigm shift between choosing a candidate using the touchpad and choosing to cast a blank ballot on the touchscreen. Another issue observed was the apparent lack of procedures for vote correction should a voter allege that the printed paper slip does not reflect his or her choice. In addition, the Center observed certain design characteristics that could make it difficult for illiterate people to cast their votes and limited the amount of time allotted for each voter to cast his or her ballot.

Voting Machine Security Features

The mission found that the CNE took reasonable steps to secure the machines, including the encryption of the voting information stored in the machine memories, the use of randomization mechanisms to prevent vote sequence reconstruction, and implementing paper receipt security measures.

In addition, the CNE put in place a number of procedural safeguards to promote the physical security of the machines, including chain-of-custody measures intended to ensure that the machines cannot be tampered with. The Carter Center team noted several minor incidents that suggest confusion among table authorities and Plan Republica officers regarding the protocols for tamper prevention and a lack of clear and consistent guidelines for all election staff. While these incidents do not prove that any manipulation occurred, they do show that it is theoretically possible. Therefore, future elections would benefit from greater procedural clarity and a consistent application of election protocols.

Result Transmission

The Carter Center team found that the CNE has taken important steps to protect the electronic system against outside attacks on the integrity of votes once they are stored in the machines and the transmission of votes from the voting machine to the tally center. The mission found it more difficult, however, to evaluate the degree of security against potential internal attacks on the system, which are possible in any electronic voting system, or the degree of security in the central tally system. Notwithstanding, The Carter Center team believes that the system would benefit from additional layers of security that could protect it from potential internal vulnerabilities.

Audit Scheme

Venezuela implemented a large number of audits in the three months preceding the election, on election day, and in the immediate postelection period, including hardware and software audits. Given its depth and extensiveness, it can be said that the audit scheme implemented for the December 2006 elections has the potential to become a robust analytical tool for ensuring the integrity of the electoral process.

To achieve this objective, The Carter Center suggests that diverse measures be taken during the pre-electoral stage as well as during the electoral and postelectoral stages. These might include a mandatory comparison of the paper receipt count to the electronic voting results during the election day hot audit, the prior determination of a margin of error and confidence level for audit samples in advance of the audit, and the allowance of the results of a paper ballot recount to form the basis of a legal challenge to the electronic election results. In the pre-electoral stage, the implementation of a series of measures aimed at enhancing procedures could substantially contribute to the achievement of the objectives of the predispatch audit (or auditoría pre-despacho.)

To read the full Final Report of the Carter Center Technical Mission to the Dec. 3, 2006, Presidential Election in Venezuela, visit www.cartercenter.org.

FINDINGS AND CONCLUSIONS

In the months following the November 2006 meeting and the December 2006 pilot mission to Venezuela, The Carter Center has reached the following conclusions about the draft methodology and plans to amend it accordingly in advance of subsequent missions and workshops:

• Checklists should include questions to capture data on the broader environment in and around the polling station.

• Observation of the legal framework is an essential component of the observation of electronic voting technologies. In particular, observers should focus on whether the law has mechanisms in place to ensure that the secrecy of the ballot is protected and that votes are counted as cast.

• Where possible, observers should observe pre-election tests and audits, noting whether access to these audits was granted to key stakeholders such as political party agents and domestic observers. This may also include whether observers were able to audit the source code and what the parameters for the audit included (e.g., whether observers received hard copies of the code and were able to review it with pencils).

• The data collected by using the baseline survey proved to be voluminous; however, it provided a fairly comprehensive overview of the system in use. Based on the amount of information involved and the subsequent task of report drafting, The Carter Center should include a longer technical appendix to the final reports of comprehensive missions so that reports are not unwieldy.

• Within the baseline survey, greater emphasis should be placed on collecting data related to the tabulation process.

• In addition to standard postelection debriefing, the Center should devise templates for election day narratives to help observers formulate their thoughts on the strengths and weaknesses of the methodology.

• The technical experts recommended greater training on the use of the baseline survey and the development of the other checklists. The Carter Center should generate a short training document to illustrate this process.

• Although the Carter Center methodology has not yet included specific checklists for observation of the tabulation center, observers should develop a specific methodology and checklists for observing the opaque processes at the tabulation center on election day and after poll closing.

• Observation missions should develop a detailed understanding of information flow among the different components of the system. A critical means of identifying the vulnerabilities of an electronic voting system is to understand the data delivery paths of the system in question. This should be a standard aspect of an observation methodology.

• Observation missions should conduct a detailed assessment of the chain of custody of the e-voting equipment. Observation of physical access issues builds on the work already conducted by international election observers and does not require advanced technical expertise.

• Observers should seek to assess not only whether the e-voting system meets certification standards, but also whether the system meets the requirements of the jurisdiction in question.

The election day forms discussed during the November 2006 meeting and used by the specialized technical mission can be found in Appendices B, C, and D. The baseline survey (Appendix A) was updated in May 2007.

Next Steps

Based on the discussions of the November 2006 meeting called "Developing a Draft Methodology for Observing Electronic Voting" and the subsequent specialized, technical mission to the 2006 Venezuela presidential election, The Carter Center plans to take the following steps to further the development of the draft methodology:

- Develop checklists to guide
  - informational interviews with vendors
  - observation in the tabulation center
  - observation of pre-election tests and audits.

- Develop a short training program for core team staff on the use of the baseline survey and other electoral checklists and forms.

- Conduct two further collaborative pilot missions focused specifically on the use of electronic voting.

Appendix A
Baseline Survey for Electronic Voting Systems

Draft

May 2007

The information gathered by answering these questions should create a comprehensive picture of the voting system in use and thus allow a more full assessment of its use.

Information should be gathered through review of appropriate legislation, decrees, bylaws and rules, and interviews with election administration officials, technical and legal experts, representatives of political parties, and domestic observation and civil society organizations.

Any supporting documentation should be retained including the elections law, certification procedures, standards against which the technology is measured, reports on past processes, and so forth. Be sure to include details about how, where, and when the information was obtained, and, particularly in the case of interviews, the name, title, and affiliation of the source of the data. This process likely will occur over a number of weeks in the months leading to election day.

After collecting as much data as possible regarding the use of the electronic voting system, a synopsis of your findings will be written. This synopsis will provide an overview of the system that can be used by other observers as a point of reference. In addition, data collected will be used to modify more generic election day and other checklists to capture information on the actual functioning of the system.

Technology Overview

1. Which types of voting system technology are used?
    a. Direct recording equipment (DRE)
    b. Precinct count optical scan equipment
    c. Central count optical scan equipment
    d. Lever machines
    e. Electronic poll book
    f. Ballot marking devices

2. Are these technologies used throughout the country? If no, please attach maps indicating where different technologies are used.

3. What version or versions of all hardware, software, and firmware components are deployed in the voting system technologies, including but not limited to any version of the following:
    a. Smart card devices
    b. Firmware used in touch screens
    c. Vote counting server
    d. Other (please describe)

4. Is this the first time these technologies have been used?

5. If no, how long have e-voting systems been used? In which previous elections were they used? Please provide separate reviews of previous elections.

6. Are there any documents available to the public containing information on the version numbers, makes, models, and functional status of these technologies? If so, please attach any relevant reports.

7. Does the technology produce a voter verified paper trail? If yes, please describe how it works.

8. Is the voter able to verify that the paper ballot matched his or her choice *before* the vote is cast?

9. Describe what happens to the paper trail during and after voting.

10. Provide an overview of the institutions responsible for the administration of the electronic voting systems, including the vendor, any certification or testing bodies, and organizations responsible for maintenance or election official training.

11. Do these organizations provide checks and balances on one another? If so, please explain how they do so.

12. Please include a diagram, detailed descriptions and, where possible, photographs of the election office components; how they are connected to one another; and their respective roles in the election process.

13. Provide detailed descriptions of the devices used in each polling place (e.g., DREs, supervisor's cards, voter's cards, memory cards), including physical descriptions, photos (if possible), descriptions of how they work, and when and how they interact with one another.

14. Please include a detailed diagram and description of how the different technologies used are networked.

Legal Framework

15. Is the use of electronic voting technologies anticipated in the current electoral legislation (or other binding legislation) or has it been introduced via subsequent decree, regulations, or other ad hoc measures?

16. Does the legal framework prescribe the type of electronic technology that is used? If so, please describe, including any outlined objectives for the introduction of this technology.

17. Does the law (legislation or subsequent decisions, decrees, and regulations) provide for transparency promotion measures, such as the use of an independent certification body and pre- and postelection audits that are open to party agents and observers? If so, please describe and indicate whether, in your opinion, access of party agents and observers to the audit process appears adequate.

18. Does the law (legislation or subsequent decisions, decrees, and regulations) require that appropriate technical steps be taken to ensure that the secrecy of the vote is guaranteed (for example, measures to ensure that the voting sequence cannot be reconstructed or that the votes cast cannot be tied to a specific voter)?

19. Does the law (legislation or subsequent decisions, decrees, and regulations) clearly outline the roles and responsibilities of public authorities, independent bodies, and vendors? Please describe.

Baseline Survey for Electronic Voting

20. Does the law (legislation or subsequent decisions, decrees, and regulations) provide a framework for contractual obligations between the state and the vendor or the independent certification bodies that is unique from standard contract law? Please describe the regulatory framework for these relationships.

21. Does the law (legislation or subsequent decisions, decrees, and regulations) make special provision for complaints and remedial actions based on the use of electronic technologies? Please provide a detailed description of the provisions and how they are related to the standard complaints procedures.

22. Do electoral offense provisions of the electoral law also apply to the new technologies in use?

Technology Vendors and Procurement of Equipment

23. If e-voting systems have been recently introduced, why were they introduced?

24. Who designed and developed the electronic voting system? Was the technology designed by the state or the vendor?

25. What vendors provide which components of the electronic voting systems? Please describe.

26. Is the technology leased or purchased?

27. Have the above vendors made contributions to political parties or campaigns? If so, please describe and attach any relevant documentation.

28. At what level was the procurement process of this technology initiated and conducted?

29. Was the vendor chosen through a transparent and competitive process? Please describe and attach any supporting documentation.

30. What reasons were given by those responsible for this choice of technology?

31. Are any of the following services included in the contract with the vendor? If so, please explain in greater detail.

    a. Timely supply of equipment
    b. Pre- and postelection testing
    c. Regular physical maintenance
    d. Regular software upgrades
    e. Replacement of equipment in case of failure
    f. Ballot design
    g. Ballot printing
    h. Warranties
    i. Other (please describe)

32. What, if any, penalty or reimbursement provisions are triggered by technical problems with the technology?

Certification, Testing, and Security of the System

Voter Verified Paper Trails (VVPT)

33. If the machine produces a VVPT, is the voter able to verify that the paper ballot matched his or her choice *before* the vote is cast?

34. What happens to the paper trail during and after voting?

35. Do rules and regulations ensure that the VVPT does not undermine the secrecy of the ballot and that voters are not able to remove evidence of how they voted from the polling station?

Certification

36. Is certification of the voting technology required by law (legislation or subsequent decisions, decrees, and regulations)?

37. What is the certification process? Please describe the process in detail, including the relationships between the different certification processes, and attach any relevant documentation.

38. Who is responsible for this certification?

39. Who pays for the certification of the technology?

40. What is the relationship between the certification body and the organization whose technology is being certified?

41. Does certification occur before or after the procurement process?

42. Is the certification process accessible to the public, political party agents, domestic observers, or international observers?

43. What standards are applied to the certification of e-voting technologies? Please attach relevant documentation.

44. Is the technology recertified after every upgrade and repair?

45. In your opinion, after systematic review, what are the weaknesses of the certification standards?

Acceptance Testing

46. Does the law require that acceptance testing take place?

47. Which components of the system undergo acceptance testing?

48. What does acceptance testing include? Please describe.

49. Who is responsible for acceptance testing?

Baseline Survey for Electronic Voting

50. Who designs the acceptance tests?

51. How often and when do acceptance tests occur?

52. Who pays for acceptance testing?

53. Who has access to the acceptance tests?

    a. General public
    b. Political party agents
    c. Domestic observers
    d. International observers

54. Under what conditions are acceptance tests conducted?

Pre-election Testing

55. Does the law (legislation or subsequent decisions, decrees, and regulations) require that pre-election testing take place?

56. Who is responsible for pre-election testing and does the law (legislation or subsequent decisions, decrees, and regulations) require that the equipment is tested publicly and by an independent body? Please explain these procedures, including who is allowed to observe testing.

57. Does the state have recommended procedures for the testing and use of each type of election equipment? If so, please describe these procedures and attach any supporting documentation.

58. Who designed the pre-election tests?

59. Who conducts the pre-election tests?

60. How many machines are tested? Please provide details of the sampling method used to conduct the pre-election tests.

61. What is the timetable for pre-election tests and where are they conducted (in a central location, provincial locations, or elsewhere)? Please provide further details and any relevant documentation.

62. Is equipment retested after every upgrade and repair? If not, why?

63. Are pre-election tests open to the general public, political party agents, domestic observers, or international observers? Please attach relevant documentation.

64. Is all voting equipment tested upon delivery from voting technology vendors?

65. Does the law (legislation or subsequent decisions, decrees, and regulations) require that pre-election testing include the following?

    a. Testing the power-up of every machine
    b. Simulation of likely voting orders, patterns, and ranges

    c.   Stress-testing with large numbers of votes

    d.   Checking vote tally

    e.   Testing correct date and time information

    f.   Testing date set to election day run-throughs

    g.   Simulations of error conditions to evaluate system response to problems and mistakes

    h.   Testing reboot and restart functionality

    i.   Testing equipment recovery from system crashes

    j.   Testing for unexplained flashing or otherwise inconsistent or potentially suspicious behavior

    k.   Checking for complete list of candidate names, party affiliations, ballot initiatives, or proposition options

    l.   Testing the use of an independent log to compare the system count and the selections made by the voter

    m.   Testing the use of an independent log to compare the paper ballots (if used) produced with the system count and the selections made by the voter

    n.   Testing of display calibration

    o.   Testing of audio ballot functionality

    p.   Testing of the security and authentication techniques used in connecting the voting machines to the network (if applicable)

    q.   Testing to ensure that the ballot information for each precinct is correct

    r.   Other (please describe)

66.   Please provide any relevant documentation outlining the regulations and procedures for pre-election testing.

Election Day Testing

67.   What tests or audits, if any, are required on election day? Please describe in detail and attach any relevant documentation outlining regulations and procedures for election day auditing or testing.

Physical Security of the System

68.   Please provide a detailed description of the technologies in place to ensure the physical security of the electronic voting system (e.g., tamper-evident seals).

69.   Who is allowed physical access to the equipment, and what measures are taken to prevent physical tampering with election equipment?

70.   Is physical access documented? If so, who maintains these records?

71.   Are vendors permitted access to the voting systems after they have been delivered? If so, for what purposes and when are they permitted access? Is this access controlled and documented?

BASELINE SURVEY FOR ELECTRONIC VOTING

72. What happens if a machine is found to have been tampered with? Please describe any contingency plans for such an event.

73. Who is responsible for transporting the machines from their storage location to testing centers and polling places? Please provide relevant documentation.

74. Is the chain of custody during the transportation process documented? If so, who maintains those records?

75. When will transportation of the equipment take place?

76. Who pays for the transportation of the equipment?

SECURITY AND INTEGRITY OF THE SYSTEM

77. Are records kept of all upgrades and repairs made to voting equipment?

78. Is any equipment used for a purpose other than election administration? If so, please provide further details of the other uses of the equipment, including the purpose, how people have physical access, other software that is required for this secondary use, and so forth.

79. Which components of the system are stored in escrow?

80. Are there written procedures and requirements regarding the storage of voting system software stored in escrow? If so, please provide further details on these requirements and the people who have access to the software.

81. Is there a cutoff date after which no further changes or updates may be made to the voting system? What is that date?

82. Please provide a detailed description and diagram of all of the data paths in and out of the components of the system.

83. How is access to the data ports secured when the equipment is not in use?

84. What is the method of transmission of information between the technologies? Please describe.

85. How are transmissions secured from alteration and interference? Please provide a detailed description.

SOFTWARE

86. Is any of the voting system software open source software? If yes, please include information on location and availability.

87. Who is responsible for inspecting the software used in the electronic system?

88. Under what conditions does the official software inspection take place? Please provide a detailed description of the software inspection process, including the length of time allotted for the inspection and the means of inspection.

89. Does the law (legislation or subsequent decisions, decrees, and regulations) allow independent inspection of the software? Please provide further details, including any pertinent reports that might be available.

90. Under what conditions are independent software inspections (including representatives of political parties and civil society) conducted? Please provide a detailed description of the inspection process, including the length of time allotted for the inspection and the tools inspectors are allowed to use.

91. Does the software inspection (either by an independent body or the official organization responsible) include checking the source code against the executable code?

92. Who is responsible for creating the executable code from the source code, and is this process subject to independent verification?

93. Is any extraneous software installed on the servers? If so, please provide further information about this software and its use.

Central Tabulating Computer

94. Who has physical access to the central tabulating computer, and what measures are taken to prevent physical tampering with election equipment?

95. Is physical access documented? If so, who maintains these records?

96. Are vendors permitted access to the central tabulating computer? If so, for what purposes and when are they permitted access? Is this access controlled and documented?

97. Are records maintained of all upgrades and repairs made to the central tabulating computer?

98. Is the central tabulating computer used for any purpose other than election administration? If so, please provide further details of the other uses of the equipment, including the purpose, the people who have physical access, other software that is required for this secondary use, and so forth.

99. Are there procedures in place that encourage independent verification of the transmission of data (such as printing of polling place election results prior to transmission to the central tabulating computer, which can be compared to the final or interim results)?

100. When is this computer networked to the other hardware in use?

101. Please describe in detail and provide diagrams of all of the data paths into and out of the central tabulating computer.

102. Is the transmission of information between the central tabulating computer and other equipment secure from any outside intervention or hacking? Please describe security measures in place.

103. What contingency plans are in place in the event of failure of the central tabulating computer? Please describe.

BASELINE SURVEY FOR ELECTRONIC VOTING

ELECTRONIC POLL BOOKS AND VOTER IDENTIFICATION

104. If electronic poll books are used, who is responsible for creating the database that is used and who has access to that database throughout the electoral process?

105. Is there an independent review of the electronic poll book database? If so, by whom?

106. Is the voter roll database connected to any other databases (e.g., databases of biometric data) ?

BALLOT BUILDING

107. Who is responsible for building the electronic ballots?

108. Is there independent review of the database from which the ballot is built?

109. Are there official guidelines or regulations for ballot building? Please attach if available.

110. What is the process for building ballots? Please provide a detailed description of this process.

111. Does the electronic ballot replicate the paper ballot in layout, candidate order, and design?

Public Confidence in Electronic Voting Technologies

112. Are civil society organizations reporting on issues related to electronic voting? If so, please attach any pertinent documentation.

113. Are the media reporting on issues related to electronic voting? If so, please provide a sample of relevant stories.

114. Are simulations of the opening, voting, closing, and counting procedures provided and open to the public? If so, please provide further information about location, timing, and attendance of the simulations.

115. Are there public information drives about the use of electronic voting?

116. Have voters, political party agents, domestic observers, or others received training on the electronic system in use?

117. Have any opinion polls been conducted related to the use of electronic election technology? If so, please attach any available results reports.

118. In your opinion, does there appear to be a sense of concern among the general public about the transparency of electronic voting systems? If so, has the state responded to these concerns? Please explain.

119. Were political parties consulted during the technology procurement process?

120. Are there any political parties or individual candidates who are campaigning on issues related to the use of electronic voting? Please provide further details.

Accessibility

121. Are ballots available in minority languages?

122. Do voters in the following circumstances use electronic voting technologies to cast their ballots? (Circle all that apply)

    a. Confined to a hospital

    b. Confined to home

    c. In prison

    d. Outside electoral district on election day

123. Does this equipment undergo the same testing as the equipment deployed to polling places?

124. Is provision made for voters who are disabled or illiterate?

125. If the machines produce a voter verified paper trail, does the paper ballot appear in such a format that it is clear to illiterate or disabled voters that their vote has been correctly cast?

Election Day Procedures

126. Please describe the intricacies of election day procedures as specified by the election law or the rules and regulations of the electoral management body, including the following:

    a. Poll opening and setup of all equipment (including production of zero tape, ensuring that all items are present and accounted for)

    b. Connectivity of equipment during the course of the day (including when, why, and how long the machines are connected to a network and what security and authentication measures are in place)

    c. Voting process

    d. Storage of spare equipment

    e. Poll closing procedures

    f. Vote counting and tabulation procedures

    g. Storage and transportation of polling place results

127. Can a voter spoil his or her ballot? If so, how? Please describe how a vote can be spoiled and what happens to spoiled ballots.

128. Can a voter cancel his or her vote prior to casting the ballot? If yes, what is the process of cancellation?

Contingency Planning

129. Does the law or official rules and regulations require the following?

    a. Contingency plans are in place in case of equipment failure.

Baseline Survey for Electronic Voting

    b. Replacement equipment is available in the event of malfunctions. If so, is this replacement equipment the same model as the technology it replaces? Is it deployed from a central location or kept at each polling place? (Please describe)

    c. Substitute technology is subject to the same testing and evaluation procedures as equipment originally deployed to polling places.

    d. Chain-of-custody procedures are in place for equipment taken out of service during an election. If so, is this chain of custody documented and are any of these documents available to the public?

    e. A process for documenting malfunctions, failures, or errors is in place.

    f. A process for obtaining election day performance records (e.g., errors and malfunctions) of specific equipment is in place.

    g. Contingency plans and procedures for partial or total power outage are in place.

130. What contingency planning training is in place for polling officials? Please describe and attach any pertinent information.

131. How do polling places and central offices communicate in case of emergencies, such as power outages, telecommunications failure, and so forth?

Ballot Counting and Recount and Complaint Procedures

132. How are ballots counted at the end of the election? Please describe.

133. Are results printed and publicized prior to their transmission to the central tabulation system?

134. Are paper ballots counted at the end of election day? If so, is the tally compared to the electronic result tally produced by the voting machine?

135. Are paper ballots from all machines counted, or is this process conducted on a statistical sample? If so, what sampling method is used?

136. What procedures are in place if there is a discrepancy between the paper ballot count and the electronic tally?

137. What triggers a recount?

    a. Voter application

    b. Candidate application

    c. Narrow margin of victory

    d. Automatic random recount

    e. None of the above

    f. Other (please describe)

138. Can a recount be requested regardless of the margin of victory?

139. Who is financially responsible for the cost of a recount? Please provide further information, including whether an individual, if financially responsible, can seek reimbursement for the cost.

140. Are paper or electronic ballots recounted? If paper ballots are recounted, were these ballots verified by the voter? Please provide a detailed description of this process.

141. What voting records are maintained?

    a. Paper ballots
    b. Electronic records stored in the hard drive or disk on module (DOM) of the machine
    c. Electronic records produced by the modem
    d. Records maintained in a secondary memory device

142. If multiple records are maintained, are these reconciled as part of the counting or recounting process? If yes, please describe.

143. In case of discrepancy, what is the ballot of record? Please provide further details.

144. Have past election results been disputed because of the use of electronic voting technologies? If so, please attach a summary of the complaint, its resolution, and any related procedural or legislative changes regarding the use of electronic voting technologies that followed.

APPENDIX B
POLL OPENING OBSERVATION FORM
Venezuela 2006

Instructions:

If you cannot answer the question because you have not observed this aspect of the electoral process, please circle N/O—Not Observed. If the question is not relevant, please circle N/A. If you answered "no" to any asterisked (*) question or irregularities occurred, please provide details on the back of the form.

When possible, ask domestic observers and political party agents for their observations during the period prior to your arrival. When applicable, fill out both the "Direct Observation" and the "Reported to Our Observers" columns, even if the responses are different.

Polling Station No.: _____

Team No.: _____   Time of Arrival: _____

City/District: _____   Time of Departure: _____

Province: _____   Date: _____

1. What technology is used in this polling station?

a. Smartmatic SAES 3000 voting machine (small DRE)	
b. Smartmatic SAES 3300 voting machine (larger DRE)	

2. How many machines are located in this polling station? _____

3. What is the number of registered voters in this polling station? _____

4. Where were these machines stored immediately prior to the election?
    _____
    _____

5. When did the equipment arrive at the polling station?
    _____
    _____

6. Who delivered the equipment to the polling station?
    _____
    _____

7. Was this chain of custody documented?   Yes   No

8. If yes, who maintains the documentation?
    _____
    _____

Poll Opening

		Direct Observation		Reported to Our Observers		Not Observed or Not Applicable	
9.	Are electronic voting machines positioned:						
	a. With enough distance between them, at such an angle, and with shields to ensure privacy?	Yes	No	Yes	No	N/O	N/A
	b. To plug into an electrical outlet?*	Yes	No	Yes	No	N/O	N/A
10.	Are the polling officials and support technicians properly accredited and identified?*	Yes	No	Yes	No	N/O	N/A
11.	Did the polling officials perform diagnostics and print the diagnostic report for all machines?*	Yes	No	Yes	No	N/O	N/A
12.	Was the setup of the machines completed without problems?* (If yes, skip to question 13)	Yes	No	Yes	No	N/O	N/A
	a. If no, could the polling station technicians resolve the problem within the specified 30 minutes?	Yes	No	Yes	No	N/O	N/A
	b. If technicians could not resolve the problem, was the machine replaced with another machine within the maximum of 120 minutes (counting from occurrence of the problem)?	Yes	No	Yes	No	N/O	N/A

POLL OPENING OBSERVATION FORM

	Direct Observation		Reported to Our Observers		Not Observed or Not Applicable	
c. If the machine was not replaced within 120 minutes, did the polling station change to manual voting?*	Yes	No	Yes	No	N/O	N/A
13. Did you observe the machines to be free from any irregular interference such as the connection of an external keyboard or any other device (except the standard release button or the standard ballot tablet)?	Yes	No	Yes	No	N/O	N/A
14. Before voting began, did each machine produce a zero tape? * (*Acta cero*)	Yes	No	Yes	No	N/O	N/A
15. Did the polling officials store the diagnostic reports and the zero tapes in the supplied envelopes?	Yes	No	Yes	No	N/O	N/A
16. Did polling officials log the identification number of each machine as it was opened and prepared for the election?*	Yes	No	Yes	No	N/O	N/A
17. Did you observe the official tamper-proof tape that sealed the case in which the voting machines arrived?*	Yes	No	Yes	No	N/O	N/A
18. Did the case contain all the required machine components?*	Yes	No	Yes	No	N/O	N/A
19. Did you observe tamper-proof seals or tape covering the ports of the machines prior to their setup?*	Yes	No	Yes	No	N/O	N/A
20. Did polling staff receive all equipment needed?*	Yes	No	Yes	No	N/O	N/A
21. If applicable, did polling staff receive an adequate number of paper ballots in case of failure of the machines?*	Yes	No	Yes	No	N/O	N/A
22. Are the machines set up so as to be accessible to disabled voters who may need special equipment, be in a wheelchair, or have other restrictions on their movement?	Yes	No	Yes	No	N/O	N/A
23. Did polls open on time?	Yes	No	Yes	No	N/O	N/A

Poll Opening — Electronic Poll Book Observation

	Direct Observation		Reported to Our Observers		Not Observed or Not Applicable	
24. Is the automated fingerprint system going to be used at the polling station? (Fingerprint system— SAV/*Captahuellas*)	Yes	No	Yes	No	N/O	N/A
25. Was the fingerprint system set up without problems?*	Yes	No	Yes	No	N/O	N/A

Comments

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Appendix C
Election Day Observation Form
Venezuela 2006

Instructions:

If you cannot answer the question because you have not observed this aspect of the electoral process, please circle N/O—Not Observed. If the question is not relevant, please circle N/A. If you answered "no" to any asterisked (*) question or irregularities occurred, please provide details on the back of the form.

When possible, ask domestic observers and political party agents for their observations during the period prior to your arrival. When applicable, fill out both the "Direct Observation" and the "Reported to Our Observers" columns, even if the responses are different.

Polling Station No.: _____

Team No.: _____   Time of Arrival: _____

City/District: _____   Time of Departure: _____

Province: _____   Date: _____

1.   What technology is used in this polling station?

a. Smartmatic SAES 3000 voting machine (small DRE)	
b. Smartmatic SAES 3300 voting machine (larger DRE)	

2.   How many machines are located in this polling station? _____

ELECTION DAY OBSERVATION FORM

3.   What is the number of registered voters in this polling station? _____

4.   Where were these machines stored immediately prior to the election?
_____
_____

5.   When did the equipment arrive at the polling station?
_____
_____

6.   Who delivered the equipment to the polling station?
_____
_____

7.   Was this chain of custody documented?   Yes   No

8.   If yes, who maintains the documentation?
_____
_____

After Polls Open

	Direct Observation		Reported to Our Observers		Not Observed or Not Applicable	
9. Do electronic ballots seem complete and contain all appropriate candidates and races?*	Yes	No	Yes	No	N/O	N/A
10. Do the screens appear to be properly calibrated?*	Yes	No	Yes	No	N/O	N/A
11. Do electronic ballots appear to be operating properly?*	Yes	No	Yes	No	N/O	N/A
12. Does the ballot touchpad appear to be properly calibrated?*	Yes	No	Yes	No	N/O	N/A
13. Are voters on electronic systems made aware by the machine that they might be undervoting?*	Yes	No	Yes	No	N/O	N/A
14. Do voters seem to find the instructions for casting a ballot clear?*	Yes	No	Yes	No	N/O	N/A
15. Do accessibility devices appear to be working properly?*	Yes	No	Yes	No	N/O	N/A
16. Do election officials keep a running tally on a regular basis through the day to ensure the number of votes on the machine is consistent with the number of people who have voted?	Yes	No	Yes	No	N/O	N/A

Election Day Observation Form

	Direct Observation		Reported to Our Observers		Not Observed or Not Applicable	
17. Are paper ballot receipts handled according to the established procedure?*	Yes	No	Yes	No	N/O	N/A
18. Are the machines' ports physically closed and inaccessible during voting?	Yes	No	Yes	No	N/O	N/A
19. Is the equipment free from network connectivity throughout your observation?*	Yes	No	Yes	No	N/O	N/A

Handling Exceptions — Please Address the Following Questions to Polling Officials

	Direct Observation		Reported to Our Observers		Not Observed or Not Applicable	
20. Are poll workers aware of contingency plans in case of equipment or system failure?*	Yes	No	Yes	No	N/O	N/A
21. Is replacement voting equipment (machines, cards, card programmers, etc.) available in the event of failure?*	Yes	No	Yes	No	N/O	N/A
22. Is the same equipment set up at poll opening used throughout the day?*	Yes	No	Yes	No	N/O	N/A
23. If no, is the chain of custody for the removed equipment documented?*	Yes	No	Yes	No	N/O	N/A
24. If voting equipment is taken out of service during election day, are votes and other relevant information extracted from it?*	Yes	No	Yes	No	N/O	N/A
25. Is there documentation outlining the failure that has occurred and recording the chain of custody for:						
a. The machine?*	Yes	No	Yes	No	N/O	N/A
b. The information drawn from the machine?*	Yes	No	Yes	No	N/O	N/A
26. In case of power loss can the equipment operate on a battery?*	Yes	No	Yes	No	N/O	N/A
27. If yes, do polling officials:						
a. Have sufficient batteries?*	Yes	No	Yes	No	N/O	N/A
b. Know the average life of the battery?*	Yes	No	Yes	No	N/O	N/A

Polling Station Officials

	Direct Observation		Reported to Our Observers		Not Observed or Not Applicable	
28. Have polling station officials received training specific to the equipment in use, including trouble-shooting in case of technical difficulties?*	Yes	No	Yes	No	N/O	N/A
29. Are polling station officials adequately instructing voters on the method for casting their ballots?	Yes	No	Yes	No	N/O	N/A

Election Day Auditing

	Direct Observation		Reported to Our Observers		Not Observed or Not Applicable	
30. Did polling officials conduct parallel testing?*	Yes	No	Yes	No	N/O	N/A

Comments

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Appendix D

Poll Closing Observation Form

Venezuela 2006

Instructions:

If you cannot answer the question because you have not observed this aspect of the electoral process, please circle N/O—Not Observed. If the question is not relevant, please circle N/A. If you answered "no" to any asterisked (*) question or irregularities occurred, please provide details on the back of the form.

When possible, ask domestic observers and political party agents for their observations during the period prior to your arrival. When applicable, fill out both the "Direct Observation" and the "Reported to Our Observers" columns, even if the responses are different.

Polling Station No.: _____

Team No.: _____   Time of Arrival: _____

City/District: _____   Time of Departure: _____

Province: _____   Date: _____

1.   What technology is used in this polling station?

a. Smartmatic SAES 3000 voting machine (small DRE)	
b. Smartmatic SAES 3300 voting machine (larger DRE)	

2. Which communication method is being used in this polling station?
    a. Fixed-line telephone ☐
    b. Cellular telephone ☐
    c. Satellite telephone ☐
    d. No transmission, but transport of memory stick to nearest transmission center ☐
        To which center? _____

3. How many machines are located in this polling station? _____

4. What is the number of registered voters in this polling station? _____

5. Where were these machines stored immediately prior to the election?
    _____
    _____

6. When did the equipment arrive at the polling station?
    _____
    _____

7. Who delivered the equipment to the polling station?
    _____
    _____

8. Was this chain of custody documented?   Yes   No

9. If yes, who maintains the documentation?
    _____
    _____

Poll Closing

	Direct Observation		Reported to Our Observers		Not Observed or Not Applicable	
10. Once voting has finished for the day, do poll workers follow procedures to complete the process and close the polls?*	Yes	No	Yes	No	N/O	N/A
11. Is the memory card containing the voted ballots removed from the port?	Yes	No	Yes	No	N/O	N/A
12. Were the polling place totals successfully printed?*	Yes	No	Yes	No	N/O	N/A
13. If not, were the proper contingency procedures followed?*	Yes	No	Yes	No	N/O	N/A
14. Do polling officials print polling place totals before sending any electronic communications out of the polling place via connection to a network?	Yes	No	Yes	No	N/O	N/A

Poll Closing Observation Form

	Direct Observation		Reported to Our Observers		Not Observed or Not Applicable	
15. Was the transmission method as originally planned for this polling station used?	Yes	No	Yes	No	N/O	N/A
16. Did the transmission to the central tally server complete?*	Yes	No	Yes	No	N/O	N/A
17. Was transmission successful at first attempt?*	Yes	No	Yes	No	N/O	N/A
18. If transmission was not performed locally and the memory sticks were transported to the nearest transmission center, were the prescribed security measures followed?*	Yes	No	Yes	No	N/O	N/A
19. Is a copy of the printed polling place totals available for public review at the end of the day?*	Yes	No	Yes	No	N/O	N/A
20. Were copies of the electronic tallies printed for all party observers (nine in total)?	Yes	No	Yes	No	N/O	N/A
21. Was public access to the audit process free from intervention by the military or other government authority?*	Yes	No	Yes	No	N/O	N/A
22. Do election officials appear to understand and adhere to the required procedures?*	Yes	No	Yes	No	N/O	N/A
23. Were there any complaints arising from the use of election equipment? If so, please provide details, including their resolution.	Yes	No	Yes	No	N/O	N/A

Election Day Auditing

24. Was a hot audit conducted?   Yes   No

25. Who conducted the hot audit?

_____
_____
_____

26. How many machines in your polling place were audited?

_____
_____
_____

27.   How were the machines selected to be audited?
_____
_____
_____
_____

28.   If an unofficial comparison of the count of the paper receipts with the electronic tally of the votes took place, did they match? If no, please explain what happened and how polling officials explained the discrepancy.
_____
_____
_____

Postelection Custody and Security

	Direct Observation		Reported to Our Observers		Not Observed or Not Applicable	
29. Are all removable memory devices removed from the equipment?	Yes	No	Yes	No	N/O	N/A
30. Is there a clear and documented chain of custody for the equipment and the saved data?*	Yes	No	Yes	No	N/O	N/A
31. Is all equipment appropriately secured in preparation for storage until the next election?*	Yes	No	Yes	No	N/O	N/A

Comments
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Appendix E
Developing a Methodology for Observing Electronic Voting Technologies

The Carter Center, Atlanta, Ga.
Nov. 2, 2006

Participants

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Democracy International

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The Carter Center at a Glance

Overview: The Carter Center was founded in 1982 by former U.S. President Jimmy Carter and his wife, Rosalynn, in partnership with Emory University, to advance peace and health worldwide. A nongovernmental organization, the Center has helped to improve life for people in more than 65 countries by resolving conflicts; advancing democracy, human rights, and economic opportunity; preventing diseases; improving mental health care; and teaching farmers to increase crop production.

Accomplishments: The Center has observed 67 elections in 26 countries; helped farmers double or triple grain production in 15 African countries; worked to prevent and resolve civil and international conflicts worldwide; intervened to prevent unnecessary diseases in Latin America and Africa; and strived to diminish the stigma against mental illnesses.

Budget: $49.1 million 2005–2006 operating budget.

Donations: The Center is a 501(c)(3) charitable organization, financed by private donations from individuals, foundations, corporations, and international development assistance agencies. Contributions by U.S. citizens and companies are tax-deductible as allowed by law.

Facilities: The nondenominational Cecil B. Day Chapel and other facilities are available for weddings, corporate retreats and meetings, and other special events. For information, (404) 420-5112.

Location: In a 35-acre park, about 1.5 miles east of downtown Atlanta. The Jimmy Carter Library and Museum, which adjoins the Center, is owned and operated by the National Archives and Records Administration and is open to the public. (404) 865-7101.

Staff: 160 employees, based primarily in Atlanta.

MARTIN FRANK

THE
CARTER CENTER

The Carter Center

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