Testimony of George Gilbert
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Regarding S. 1487

Before the Committee on Rules & Administration
Of the
United States Senate
July 25, 2007

I am Director of Elections for Guilford County, NC (Greensboro, High Point) with roughly 310,000 registered voters. I have been in this position since February, 1988. Throughout my tenure, Guilford County has used direct electronic voting systems. We currently use the ES&S iVotronic with a state mandated paper trail. 2006 was the first year the paper trail has been required. In my former life, I was a Legislative Assistant to Senator John Culver (IA) from 1976-1980 and Senator Chris Dodd (CT) from 1981-1982. In recent years I have served on the Election Center's National Task Force on Election Reform and have participated regularly in National Academy of Science and American Association for the Advancement of Science workshops on electronic voting and Federal Election Assistance Commission working groups on election management guidelines.

As an election official with 19 years of electronic voting experience, I am a strong advocate of "independent" backup mechanisms for DRE voting equipment. These systems, like any other can fail or provide inadequate safeguards against ballot loss. Contemporary backup of voted electronic ballots using independently developed systems would go a long way in insuring against irretrievable losses due to software design failures, hardware failures or malicious code.

The proposed "voter verifiable paper audit trail" (VVPAT) is one method of providing such backup. The questions that election officials are asking you to examine carefully are:
> 1) Will VVPAT actually accomplish the objectives you are seeking, and
> 2) Is VVPAT the best way to accomplish those objectives.

The following testimony addresses these questions in two parts. The first part examines the principles, or apparent goals, behind S. 1487 and compares them to the requirements of the bill. Part II introduces both data and anecdote from elections experience that demonstrate the inadequacy of a manual count system to accomplish the bill's objectives.

I conclude with specific recommendations for Congressional action that I believe will more effectively accomplish the objective of restoring voter confidence through building a sustainable

Summary

We begin with the proposition that enhancing voter access to the ballot and voter confidence in our elections is the objective of this legislative exercise.

The fundamental question election officials pose is: <u>Will</u> the proposed mandate of a "voter verifiable paper audit trail" and the proposed <u>manual counts of</u> such <u>paper successfully address the perceived voter confidence problem.</u>

Even if the alleged "public outcry" of distrust of "electronic voting" systems exists, the Congress retains a sober duty to carefully examine the evidence as well as the alternative solutions and their likely consequences rather than simply acting to pacify the loudest voices.

Even without gross error or evidence of fraud, close elections magnify the passions of the people, the parties and the candidates. The length of time it takes to determine the outcome of an election exacerbates and distorts these passions.

The challenge to the Congress is to respond to the concerns of the people with a solution that addresses the source of the concern in a manner that minimizes its recurrence. <u>It should raise a skeptical eye that the proposed "solution" lies among the roots of origin of the "concern," ie., the inability to effectively manually count the paper records in Florida in 2000 and Washington State in 2004</u>.

Based on these two precedents (and that of many other close elections), <u>it is unlikely that "audits" would have made any difference.</u> Even the current legislation recognizes the ultimate necessity, in close contests, of full recounts in order to provide a conviction of accuracy sufficient to engender public confidence. Thus far, paper based manual recounts have failed in execution and have, in fact, exacerbated the mistrust.

We must find a way to conduct elections so that the outcome is reliably determined, swiftly and securely, including the execution of recounts in close elections.

<u>Certified and tested electronic systems provide the highest level of reliability, accuracy and security society has yet to devise.</u> Where life and death are at stake…in automobiles, airplanes, nuclear power plants, chemical factories….redundancy, electronic monitoring and backup systems are the rule. Not all, but most, failures of these systems are the result of human error.

The proposed VVPAT mandate has significant implications for many of the broader election concerns. <u>The unintended consequences of a VVPAT mandate include reduced accessibility and more rigid limits on provisional voting, early voting, voting centers and same day registration.</u>

<u>Electronic redundancy with independent verification can, with the support of the Congress, be ready for use in election systems within the same time frame as sufficiently reliable VVPAT systems. Such systems offer far more promise than paper for meeting the broad range of election reform needs.</u>

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Part I: The Principles

A. <u>The Goals of the People</u>

To have confidence that like minded citizens are given the maximum opportunity to vote and that their votes are recorded and counted correctly.

It should not be viewed as a criticism of the people that they favor the votes of those who agree with them. Recognition of this fact is instructive regarding the passions and responses that are elicited by closely contested elections.

It is likely the underlying desire of most citizens that elections be fair and open to all. Thoughtful persons recognize that the best security of their own liberty lies in securing the liberty of all citizens equally.

S. 1487 represents an attempt to enhance voter confidence as well as the principles of equality. Questions of reliability, accuracy and security in voting have been vocally raised in the halls of the Congress. Paper ballots, under the moniker "voter verified paper audit trail," or VVPAT, have been put forward as the frontrunner among alternative "solutions."

(It should be noted, on behalf of the voters, the legal burden implied by the term "voter <u>verified</u>." The more prudent term "voter <u>verifiable</u>" would not alter the acronym and would be more accurate and less subject to challenge.)

But obtaining an accurate count <u>after</u> an election has been conducted is only a small part of achieving equitable opportunity and confidence in the integrity of and election. S. 1487 recognizes this more comprehensive picture but addresses it only piecemeal and without adequate attention to internal contradictions.

As a result, satisfying the goal of increased confidence is likely compromised. At best, it provides an insecure foundation for sustained results.

B. <u>The Role of the Congress</u>

Even if the alleged "public outcry" of distrust of "electronic voting" systems were extant,[1] the Congress retains a sober duty to carefully examine the evidence as well as the alternative solutions and their likely consequences.

We are directed to a good starting point by Dr. Tracey Campbell, associate professor of history and co-director of the Wendell H. Ford Public Policy Research Center at the University of Kentucky, in his recent work <u>Deliver the Vote: Election Fraud. an American Political Tradition-1742-2004.</u> Regarding VVPAT, he says,

"*This reform, however, represents the triumph of hope over history.*"

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[1]   Evidence on this claim is lacking. InfoSENTRY Services, Inc., has, for several years, contracted with Opinion Research Corporation to survey public opinion on voting system security. While some erosion in overall confidence has been reflected, the survey has detected no significant difference in voter confidence comparing direct electronic and optical scan voting systems both of which reflect high levels of voter confidence exceeding 65% and very low confidence levels at less than 10% of respondents surveyed .

 See http://www.infosentry.com/US_Public_Opinion_Toward_Voting_Technology_20040301.pdf for the 2004 White Paper reporting these results. Recent data reflecting no significantly different conclusions will be published in the near future.

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While our nation itself represents the "triumph of hope over history," even the "*Federalist*" authors, particularly James Madison, recognized that this outcome depended critically upon the *triumph of institutions over instincts*.

While "voter verifiable paper audit trail" has an instinctive ring to it, both its direct and unintended consequences should be carefully examined.

C. The Roots of the Problem

1)   *Close elections magnify the passions of the people, the parties and the candidates.*

2)   *The length of time is takes to determine the outcome of an election exacerbates and distorts these passions.*

Understandably, confidence is undermined when the unfulfilled passions of the losing side convert to anger and/or cynicism.   Where a widespread "crisis of confidence" exists (see Footnote 1), restoration of confidence rightfully should receive the priority attention of our political institutions.

The challenge to the Congress is to respond to the concerns of the people with a solution, in this case, that addresses the source of the concern in a manner that minimizes its recurrence.

In the present case, it should raise skeptical concern that the proposed "solution" lies among the roots of origin of the "problem." The most celebrated instances of voter disaffection include the inability of the election apparatus in several Florida and Washington counties, notably large ones, to manually count, in a timely fashion, the paper ballots and resolve the ambiguities reflected on some of these ballots. While a handful of "electronic ballot" failures have also been alleged, one of which is clearly documented, it is hard to imagine that a national "crisis" has emerged consequent to one improperly executed electronic voting system in Carteret County, North Carolina.

The roots of the problem appear to be deeper and broader than the proposed solution can encompass.

D. The Solution

Conduct elections so that the outcome is reliably determined swiftly and securely including the execution of recounts in close elections.

Time is of the essence in reporting and certifying election results. Delays create doubt, doubt gives birth to rumors of conspiracy and rumors of conspiracy erode confidence.

But inconsistencies also create doubt and a rush to "certify" an election result before such inconsistencies are reconciled can have a similar effect on confidence to that of delay. "Certifying" an election result and producing an accurate count of the voters' intentions are, as we know, not necessarily the same thing.

Clearly the "certified" result must be convincingly accurate. This, I assume is the chief purpose that lies behind the mandate for a "voter verifiable paper audit trail." In-so-

far-as an "audit" of paper records goes, the election administration community has fairly effectively demonstrated its ability to do that. While manually tabulated "audit" results frequently diverge slightly from optically scanned and DRE tabulated results, they can be and have been produced with an accuracy and reliability sufficient to meet the "convincingly accurate" standard in most cases. (See Part II for documentation and discussion.)

"Most cases," however, meet by the weight of the numbers the standards necessary to enlist voter confidence. People tend have confidence in the veracity of the outcome of any contest where the margin of victory is reasonably large. The presumed integrity of the election process, with bipartisan participation and oversight together with standard voting system testing, is sufficient to instill voter confidence with or without a manual audit of paper.

Close contests, however, are subject to a different standard. Would even a "convincingly accurate" audit of the presidential contest in Florida in 2000 have averted a full recount? Could the Governor's race in Washington in 2004 have been resolved by a "convincingly accurate" audit? North Carolina has long provided in law for "mandatory" recounts (upon request of an apparent loser) of close elections. <u>Even the current legislation recognizes the ultimate necessity, in close contests, of full recounts in order to provide a conviction of accuracy sufficient to engender public confidence.</u>

But at this point S. 1487 and similar proposals encounter a dilemma:
- We have no measure of the accuracy of a manual count of paper ballots,
- All evidence from experience indicates that any such attempt will lead to a protracted and passionate public spectacle, and
- The more frequently physical records are handled, the less secure is their integrity.

Thus, the proposed solution, one that perhaps instinctively "satisfies" the passions and instincts of the public, is suspect in its ability to produce a "true" solution of reliable, swift and secure results.

E. <u>Reliability, Efficiency and Security</u>

<u>Standards for yielding the desired levels of reliability, efficiency</u> (as measured by time, accuracy and cost) <u>and security, to be effective, must apply to all voting systems used in an election.</u> Here we have a huge gap that is not addressed, and is, in fact, widened by S. 1487. That is the lack of standards for the manual tabulation of paper ballots.

Our voting systems today are largely comprised of optical scan systems, direct electronic systems and manual paper systems. We have standards (or "guidelines") for optical scan systems. We have standards for direct electronic systems. While s. 1478 initiates a general standard for the <u>production</u> of paper audit records, there remain no standards, technical, procedural or otherwise, for the manual tabulation of paper ballots or paper records of ballots. (Yet S. 1487 mandates that all recounts, which occur only in the closest contests, be conducted by the manual counting of the paper records.)

A number of studies and tables documenting common disparities between automatic and manual counts of paper ballots are presented in Part II of this testimony. These demonstrate that manual counts of optical scan, punch card and other paper based voting

systems have a particularly high rate of discrepancy due primarily to the ambiguities voters create in marking such ballots. (See Part II discussion & data)

Further, a recent HAVA grant proposal submitted to the NC State Board of Elections by the NC A&T State University stated, regarding the manual tabulation of paper records,

> "*At present we know of no method for systematically testing accuracy and security in this essential phase* of VVPAT systems." (emphasis added)

Considering that human error cannot be eliminated from any human enterprise, this assessment is no more that a sophisticated statement of the obvious. System designs can be examined by experts, tested and secured. Once this is done, they always perform the same task in the same manner.

Human judgment and performance, on the other hand, is constantly subject to unpredictable and unsecurable deviance. Each "test" of human performance is an non-replicable event. Even process or procedural designs to govern and secure human performance cannot be demonstrated to consistently meet a fixed accuracy or performance standard.

In effect, the substitution of manual tabulation of paper ballots for certified electronic systems replaces a system that cannot be proven to be perfect but which can be proven to a high level of reliability with a system that cannot be proven to any given level of reliability and which is known to be imperfect in unpredictable ways.

In addition to the lack of a certified (or certifiable) tabulation procedures for manual counting of paper, the process is tedious, time consuming and often subject to highly contentious ambiguities. The difficulties of executing the manual tabulation process were clearly demonstrated in both Florida and Washington.

The public conduct of this process, while enhancing its perceived "transparency," also has its downside in heightening public perceptions of uncertainty and partisan contentiousness revealed in the process. These, of course, run counter to the purpose of enhancing public confidence.

It is also critical that we distinguish between the requirements of an "audit" and those of a "recount." North Carolina's two week election to canvass period, for federal elections, was sufficient, in 2006, to accommodate its 1% manual audit requirement. However, this audit involved only one ballot contest, occurred in an off year election with relatively few provisional ballots to process (220 in Guilford County compared to 2,400 in 2004) and required the manual tabulation of relatively few ballots due to low turnout (again, in Guilford County, 101,000 votes as compared to 201,000 in 2004).

As a practical matter, a full manual recount of all ballots in a US Senate contest in North Carolina in 2008, could not, in the larger jurisdictions, be competed in less than a month, providing any hope of accuracy and security. A common experience has been documented in other jurisdictions (See Part II discussion of Attachments 5, 6 & 8).

The length of time it is likely to take to complete a manual recount of paper records in a federal election, again, runs counter to the goal of obtaining timely results.

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Regarding the question of the integrity of the physical evidence, ie., the paper ballots, the prospects for mishandling this paper poses a far greater threat to the integrity of the record than does the character of the paper on which that record is printed. While King County, Washington provides the most celebrated recent incident of "misplaced" ballots, similar embarrassments occurred in 2004 in my county of Guilford and in Cleveland County, North Carolina.

It was election administrators …predecessors of mine…. who initiated the national voting system standards and voting system certification program. These were practical visionaries who understood the dangers of rigidity and universal mandates in an enterprise the very foundations of which lie in synthesizing unity from diversity. Neither the problems nor the solutions to perceived election problems can be fixed in time or technology.

Both history and modern science tell us that perfect reliability, accuracy and security are not attainable….in either human or machine performance. All evidence suggests that the current generation of automated voting systems, in particular direct electronic systems, are the most accurate, the most reliable, the most secure (and the most accessible) systems that democracy and the free market have ever conspired to produce.

Recounts, especially, should be executed using certified and tested voting and tabulation systems. The VVPAT option, while perhaps sufficient, in the absence of better alternatives, for securing "convincingly accurate" audits, appears insufficient to meet the reliability, efficiency or security needs of recounts.

The degree to which our voting systems will continue to improve in reliability, efficiency and security will be driven largely by the degree to which the market is directed and encouraged toward that end. S. 1487, as currently conceived, would hinder rather than promote this progress.

F. <u>The Role of the Senate</u>

From an early age we are taught that the system of "checks and balances" established by our Constitution provides a means by which each of the three branches of government can protect against abuses (or errors) by any of the others. In addition, the deliberate designs of the Senate and the House of Representatives were envisioned as a part of the constitutional checks and balances.

Madison saw the role of the Senate as a deliberative constrain against the likelihood that the House would more closely reflect the "temporal passions" of the people. Madison expected the Senate to take a longer as well as a broader view of issues than the House might in general be inclined to do.

The current "passion" of the House seems to be paper ballots…..in particular, counting such by hand. The bill before us today parallels that reaction. A thoughtful examination, however, of the concept's differential significance for the Senate and the House would be well advised.

Members of the House of Representatives are elected by a few tens to a few hundred thousand votes every two years. Districts are the same size roughly representing .23% of the population each. It is a small stretch for a member of the House to envision his

or her contest being recounted by a manual count of a few ten thousands or even a few hundred thousand paper ballots.

Many members of the Senate, however, are elected by several million votes. The Chairwoman is a good case in point receiving, last year, more than 5 million votes in an election in which a total of near 9 million votes were cast. In contrast to the .23% represented by each Member of the House, her constituents represent 12% of the population of the United States.

In California, as well as in a number of other states, these millions of votes are concentrated into a relatively small number of administrative jurisdictions. Los Angeles County contains 25% of California's 22.7 million registered voters. Salt Lake County, Utah, contains near 40% of the state's 1.5 million registered voters. Such jurisdictions long ago availed themselves of the technological aids necessary for managing the massive volumes of data, and votes, for which they are responsible. .

The prospect of managing this volume of ballots manually is, to put it mildly, daunting. California already provides the longest post-election period in the nation prior to the official canvass of votes…..28 days. This period is presumably needed to accommodate the state's 1% manual audit requirement. In most states' the election to canvass period ranges from two days to two weeks. How long would California need for a 100% manual recount?

The standards for establishing a "reasonable expectation" in the Senate are clearly different than the standards that apply to the House. The compelling, if not unique, responsibility of the Senate is to devise a remedy that works as well for 10 million ballots as for 10 thousand. Again, as currently conceived, s. 1487 appears to fall short of meeting this challenge.

The role of the Senate also involves looking beyond the narrow passions of the moment to the broader possibilities for the future. S. 1487 also addresses voting system accessibility, absentee voting, provisional voting, early voting, the integrity of voter registration lists and poll worker training. The additional emergence of voting centers and electronic poll books hold promise for improving both public access and the security of elections.

The proposed VVPAT mandate has significant implications for many of these corollary concerns. The unintended consequences of a VVPAT mandate include heightened accessibility concerns and more rigid limitations on the effective implementation of provisional voting, early voting and voting centers. There are clear practical disincentives to the use of direct electronic voting systems imposed by a VVPAT requirement. Yet, without direct electronic voting, implementation of early voting and voting centers is far more difficult and error prone.

Further, integration of electronic poll books with direct electronic voting equipment offers the prospect of readily providing any jurisdictional ballot to any voter appearing at any polling location…be they a provisional voter, same day registrant or simply a registered voter in the wrong place.

The Senate, again, has the compelling responsibility to thoroughly examine these unintended consequences. S. 1487 poses a very real threat to realizing other significant goals of this and other recent elections legislation.

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Part II: The Practice

Among the chief historical weaknesses in many direct electronic voting systems has been the lack of a secure, independent ballot record for each voter's vote.

Among the chief weaknesses of paper voting systems, whether punch card or optical scan, is the frequency of casting ambiguous votes.

North Carolina's experience in 2006 graphically illustrates both these points.

Attachment 1, VPAT Printer problems in North Carolina, shows the rate of VPAT ("verifiable paper audit trail") printer failures we experienced across the state during the 2006 general election. Of the more than 5,000 DRE voting machines used in the state for that election, more than 550 experienced problems. The impact of this fact alone on the verification of the tabulation from the paper record is clear…..it cannot be done to the level of accuracy needed in elections.

I believe it is important to note that, the primary impact of the VPAT system mandated by the NC General Assembly for 2006, was the introduction of another point-of-failure into the voting process.

 This was not Guilford County's first experience with backup printers on DRE voting machines. The voting system we used from 1990 through 1999 also had a backup printer. It was not visible to the voters and it was not a thermal printer. Its failure rate was closer to 20%. Fortunately, most printer failures did not stop the voting machine and went unnoticed until tapes were retrieved after an election.

The impact of such printer failures is demonstrated in Attachment 2 – "Guilford County, NC, November 7, 2004, General Election, Manual Audit Results."   Of the 9 machines included in our state mandated audit[2] four experienced printer problems. Fifteen votes were not recorded on the paper tapes. This constituted 2% of the total votes cast in the two precincts that were audited. In one case, the printer jams resulted in our not being able to detect that two voter's ballots had been canceled after being printed but prior to being cast. As a consequence, our manual count indicated two more votes than were electronically recorded on the machine. We learned of the two vote cancellations when we contacted the precinct officials.

This experience demonstrates both the danger of declaring, as the "Official Count," the manual count of the paper record and the requirement of outside auditors. VPAT printer records will be destroyed due to printer failures. North Carolina law recognizes this by stating that the paper record "shall control, except where paper ballots or records have

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[2] State Statute mandates a "statistically significant" number of precincts to be included in the audit. The audit design was developed by Dr. William Kalsbeek of the University of North Carolina, Chapel Hill. His audit evaluation report of the spring, 2006, primary is included as Attachment 7.

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<u>been lost or destroyed or where there is another reasonable basis to conclude that the
hand-to-eye count is not the true count."</u>

S. 1487 somewhat replicates this contingency provision regarding "lost" VVPAT records
from DRE machines. With respect to audits, this provision is a reasonable accommodation
to reality. With respect to recounts, a different standard applies if the paper record
represents the "official" record of votes.

The problems created by reliance on manual tabulations of paper are not confined to DRE
VPAT systems. Optical scan voting systems have their own set of issues. As noted above,
ambiguous or mismarked ballots are chief among the weaknesses of optical scan systems.
<u>Attachment 3, "Error Rate Comparison of Manual Audit by Voting System",</u> and
<u>Attachment 4, "Ballot Errors Reflected in Manual Audit,"</u> provide an unambiguous example
of this. While manual counting of both VPAT records and optical scan ballots experience
unresolved tabulation errors, <u>by far the largest source of discrepancy between the
automated tabulations and the manual resulted from detection or interpretation of voter
intent during the manual audit of the optical scan ballots.</u> Fully 90% of the scanned vs.
manual count discrepancy was attributed to ballot marking errors by voters. While this may
indicate a need for manual review of optical scan ballots prior to a recount, it demonstrates
that a manual "audit" of such ballots will seldom yield the same result as the automated
scan.[3]

I am sure you are all aware of the stories of the lost electronic votes in Carteret County,
North Carolina, in the 2004 election. You also need to be aware of the ballot box , in the
same election and state, of 200+ optical scan ballots that, when accidentally left in the
polling place (a fire station) overnight, was irretrievable sent to the county dump the next
day.

Perhaps the greatest weakness of reliance on manual paper tabulation is it consumption of
the resource of which we are generally in shortest supply – Time! <u>Attachment 5, "NC—
2006 Sample Audit Time"</u> reflects a tremendous disparity between the fastest and slowest
audit rates in terms of seconds per ballot. The extremes are likely accounted for by
reporting or interpretation errors, never-the-less, at even the average rates manual
tabulation is a slow process.

Guilford County was near the average manual tabulation rate for DRE with VPAT systems.
Had we been required to perform a manual recount of all 101,271 ballots cast in the
November, 2006, general election, it would, at that rate, have taken us 723 hours….that is
90 days! With two counting teams perhaps we could cut that to 45 days….with three, 30
days….with 10, perhaps 9 days. Of course, the 201,000 votes cast in the 2004 presidential
election would double all these time/counting team projections.

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[3] For additional studies of manual vs. automated recounts discrepancies see
http://www.vote.caltech.edu/media/documents/wps/vtp_wp11.pdf and
http://www.vote.caltech.edu/media/documents/wps/vtp_wp32.pdf
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I do not know how many competent simultaneous counting teams could be managed effectively, maintaining quality control. Generally such teams are made up of experienced election personnel….the same personnel who had just completed four to six consecutive 60 hour weeks and the precinct officials who have see all the ballots they care to see for another four years…..or forever.

This human factor in manual tabulation is clearly depicted by the recent report on the Cobb County, Georgia, "Pilot Project on Voter Verifiable Paper Audit Trail." (See Attachment 6) as well as in Conny McCormack's December 4, 2006 report for Los Angeles County, "November 2006 Election Report: Manual To Machine Count Comparison Of Randomly Selected 5% Electronic Touchscreen Voting Units (Attachment 8).

 Perhaps the best example, however, derives from a case with which we are all familiar….Florida, 2000. Keep in mind, not every Florida county failed to complete its manual recount. But apparently not every county has to come up short. As we see in Attachment 6, there is great diversity in election administration circumstances and capabilities. Setting a deadline does not always get everybody there on time.

In comparison, when Guilford County, North Carolina recounted the 200,000+ electronic audit records (individual electronic ballot records) from our 2004 election it took 14 seconds to retabulate the entire ballot once the audit records had been imported into the computer.

Some of the problems revealed by the 2006 North Carolina and Georgia experiences were the result of inexperience. Some were the result of new products being rushed to market due to stringent statutory timetables (both state and federal). Some can be ameliorated. Some cannot. Yet, as election administrators, we are charged with the effective conduct of every election….and election day is not negotiable.

Election officials will do everything possible to conduct effective, fair and accurate elections. However, as the law imposes shorter timetables and more failure prone technology, more jurisdictions will fail.

Alternatives and Recommendations

You may have noted that I began my testimony with an endorsement of independent backup mechanisms for electronic voting and tabulation systems. I then proceeded to detail the inevitable failure of paper as a viable means of meeting this goal.

I would like to close my statement with a brief discussion of alternatives. If you give us no alternatives, we will eventually suffer the consequences inherent in reliance on paper records and manual tabulation.

My experience is primarily in DRE voting and I will not presume to propose solutions for perceived optical scan system problems. Keeping in mind that the same software generally tabulates the votes for both types of systems, similar, voter verifiable electronic backup and monitoring systems could likely be developed for both.

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The December 1, 2006, NIST report to the Technical Guidelines Development Committee (TGDC) established by HAVA stated:

"The approach to software-independence used in op scan is based on voter-verified paper records, but some all-electronic paperless approaches have been proposed. It is a research topic currently as to whether software independence may be able to be accomplished via systems that would produce an all-electronic voter-verified, independent audit trail (known as *software IV* systems). In cryptographic E2E voting systems, there may be no audit trail in the sense of what exists with op scan or DRE-VVPAT, but the correctness of the election results can still be proven via the cryptographic protocol that the system is based upon. E2E systems are an active research topic and one E2E approach has been marketed[4]"

Further:

"The STS believes that current paper-based approaches can be improved to be significantly more usable to voters and election officials, and that other kinds of all electronic IV (software IV) and E2E cryptographic systems may possibly achieve the goal of secure paperless elections."

Among the TDGC recommendations arising out of this were:

- Requiring software-independence in future voting systems – this means that future voting systems must use verifiable voting records for independent audits, and
- Creating a process to include new and innovative voting systems with greater usability, accessibility, and security.

S. 1487, as currently written, appears to preclude the use of voter verifiable electronic audit mechanisms. As NIST and the TGDC note, voter verifiable elections audit systems need significant improvement. This will only happen through research and development.

North Carolina is currently working toward   establishing, at North Carolina A&T State University, a research and development program on voter verifiable independent electronic audit system using open source software. Such research should be encouraged to insure continued progress in the development of improved verifiable voting technology.

Some of the advantages of electronic backup systems include
   o Equally accessible to all voters regardless of disability
   o Can provide accurate and efficient recounts, in addition to audits, in the event a voting system tabulation error is discovered
   o Can be integrated into the voting process so that voters do not have to perform double ballot verifications
   o Can offer open source code without impinging on the security or proprietary nature of the voting system software
   o Minimizes impact of human error in audit or recount processes
   o Enables audits and recounts to be completed in a timely manner

Machines and systems upon which our lives depend are ubiquitously backed up and monitored electronically. Their reliability is not based on computer scientists' assurances

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[4] See http://www.votehere.com.

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that these systems are perfect….that they are defect free. These systems are extensively tested for reliability and carefully monitored by other systems to detect any threat to their proper performance.

Such electronic backup and monitoring systems can be ready for widespread implementation by 2010 if the Congress supports rather than forecloses their development. That is the same timetable that is realistic for the currently proposed paper mandate.

The possibilities, afforded by positive and efficient enhancements to the security of electronic voting machines, to a broad range of election management innovations are immense.   Ballot accessibility, early voting, voting centers, provisional voting, same day registration and poll book integrity can all be enhanced…if direct electronic voting systems are not effectively foreclosed.

I strongly urge you to, not only keep these doors open but to open them wide with your active support. Without your support for continued innovation in elections technology, we will suffer major setbacks in our efforts to open the election process to all persons on an equal footing and we will have failed a century of progress.

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