

# Flight Simulation for the Brain

## *Why Army Officers Must Write*

Major Trent J. Lythgoe, U.S. Army

**W**RITING IS ON the decline in the Army officer corps. Thoughtful, precise writing in staff papers has been replaced by hastily composed emails and PowerPoint slides filled with incomplete sentence bullet statements. This deterioration of writing skills is causing a corresponding deterioration of thinking skills. Writing, although valuable as a communication medium, is most valuable as a powerful way of thinking. Writing forces us to order thoughts in a logical and coherent way. It forces us to critically examine our own thinking, which ultimately leads to better thinking, better problem solving, and better decision making. If the Army wants better thinkers, we should start by educating better writers.

### **A Crisis in Writing**

The decline of writing in the Army is part of a broader writing crisis in America. According to the most recent writing survey of the National Assessment of Education Progress, only 33 percent of 8th graders and 24 percent of 12th graders can write proficiently.<sup>1</sup> Predictably, many American students go to college with poor writing skills. A college writing professor received this email from a prospective student:

i need help, i am writing a essay on writing i work for this company and my boss want me to help improve the workers writing skills can yall help me with some information thank you [sic]<sup>2</sup>

The writing crisis is filtering into the American workforce. According to a 2006 study, 27.8 percent of businesses report that college graduates were “deficient” in written communications. These same businesses ranked written communication as the most important skill for incoming workers with four-year degrees.<sup>3</sup> A recent survey of business leaders found that 40 percent of companies either offer or require writing improvement training for employees with writing deficiencies (at an estimated annual cost of \$3.1 billion).<sup>4</sup>

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PHOTO: U.S. Army SPC Conklin writes his essay during the Task Force Gridley Soldier of the Quarter Competition in Paktika Province, Afghanistan, 21 March 2011. (U.S. Army, SSG Anna Rutherford)

Predictably, the writing crisis is affecting the Army. Like American businesses, the Command and General Staff College has implemented a writing improvement program to help ill-prepared Intermediate Level Education students improve their writing skills. Anecdotal evidence of declining writing skills abounds in the millions of poorly written emails sent by Army officers each day, many of which resemble the email above.

We cannot put all the blame for the Army's writing woes on America's education system. There has been a precipitous decline in formal writing within the Army itself. Staff studies and decision papers, once a mainstay of staff work, are almost a thing of the past. The old FM 101-5 had an entire appendix on staff studies and decision papers now absent in its replacement, FM 5-0. All that remains in today's FM 5-0 is an appendix on military briefings. Army Regulation 600-67, *Effective Writing for Army Leaders*, was last updated 25 years ago, a reflection of our institutional apathy toward formal writing. Email and PowerPoint slides have usurped formal writing as the preferred written communication media, and both are contributing to the problem.

Email is contributing to the deterioration of writing skills. This may seem counterintuitive since email is a writing medium. Consider, however, that while the average Army officer may send scores of emails every day, few take the time to compose thoughtful, well-written messages. Moreover, why should they? Unlike formal staff papers, there are no brevity, grammar, or correctness standards for emails. Many leaders do not demand well-written emails. The result is officers who practice poor writing day in and day out, which is arguably worse than not writing at all.

The widespread use of PowerPoint is another contributor to the demise of writing. PowerPoint slides are now the preferred medium for transmitting and receiving information in the Army. The problem is that PowerPoint does not require officers to formulate complete ideas or to put those ideas together in a logical way. Instead, officers reduce their thoughts to "bullet statements," a phrase that is shorthand for incomplete sentences. Many cut and paste PowerPoint slideshows from other slideshows. Officers assemble the slides without thinking about how, or even if, the ideas go together. Too many officers spend more time thinking about

pictures and fonts than they do thinking about the substantive issues at hand.<sup>5</sup>

Although the demise of writing as a means of communicating ideas is regrettable, there is a far more concerning side effect of this trend. Writing is a form of thinking. As the writing skills of Army officers atrophy, our thinking skills may be wasting away as well.

## Writing as Thinking

*"Forward, the Light Brigade!"*

*Was there a man dismay'd?*

*Not tho' the soldier knew*

*Someone had blunder'd . . .*

*Into the valley of Death*

*Rode the six hundred.*—Alfred, Lord Tennyson

Writing is a supremely important communication skill for Army officers. One of the most infamous military writing failures occurred at the Battle of Balaclava, leading to the infamous "Charge of the Light Brigade." A British cavalry commander misunderstood an ambiguous order written by his commander. Instead of moving to prevent the opposing Russian force from repositioning its artillery, the cavalry instead charged unsupported into the teeth of the Russian defense, suffering heavy casualties. Even today, written orders remain the centerpiece of battlefield command and control despite exponential technological advances. Army officers must clearly convey in written orders the mission, the commander's intent, and tasks to be accomplished.

Additionally, the Army's promotion and command selection processes depend heavily on good writing. Board members rely on rater and senior rater comments from officer evaluation reports to make promotion and command selections. Officers must be able to clearly articulate the leadership potential of subordinates in written form. Retired Major General Larry Lust, who sat on several promotion boards, observes, "The board is very good at picking the best paper. If officers in the field can't write accurate evaluation reports, then the board can't pick the best leaders for promotion and command."<sup>6</sup>

Although writing is an important communication medium, it serves its most important function as a means of thinking. According to John Gage of the University of Oregon, writing allows us to critically examine our own thoughts:

***Although the demise of writing as a means of communicating ideas is regrettable, there is a far more concerning side effect of this trend. Writing is a form of thinking.***

Writing is thinking-made-tangible, thinking that can be examined because it is “on the page” and not all “in the head,” invisibly floating around. Writing is thinking that can be stopped and tinkered with. It is a way of holding thought still long enough to examine its structures, its flaws. The road to clearer understanding of one’s thoughts is travelled on paper. It is through an attempt to find words for ourselves, and to find patterns for ourselves in which to express related ideas, that we often discover what we think.<sup>7</sup>

Gage’s assertion that “writing is thinking” is not just a metaphor. According to Richard Menary of the University of Wollongong (Australia), the act of writing is actually a unique cognitive process. Menary contends that writing is more than the simple physical expression of neural thought. The physical act of writing, when combined with neural processes, constitutes a distinctive form of thinking with advantages over neural processes alone. In his words, “These [written] vehicles thus afford us new cognitive transformations which would be either impossible or extremely difficult by relying solely on neural resources.”<sup>8</sup> Menary’s proposition seems to embody the notion of author E.M. Forester when he wondered, “How do I know what I think until I see what I say?”<sup>9</sup>

Writing leads to better thinking, decision making, and problem solving because it organizes our ideas in ways our brain can use. We sometimes imagine the human brain is a computer that stores individual pieces of data, just like a laptop computer. However, our brain can’t work that way because the space required to store the billions of details of everyday life would be astronomically large. To deal with this problem, our brain skips small details and instead looks for big ideas and the relationships that connect

them. These ideas and relationships become mental models, our personal set of assumptions about how the world works. The process of writing forces us to put our disorganized ideas into coherent structures of actors and relationships that are useful as mental models.

Functionally, the human brain operates more like a pattern recognition and comparison engine using mental models to make sense of the world around us. Our brain continually looks for emerging patterns in the environment and then compares those patterns with stored mental models. When we come upon a new situation, our brain digs through its archives to find a mental model that matches or approximates the new situation. The brain uses the model to construct a story about the situation to discover what happens next. This process of story building is called mental simulation.

## Writing as an Idea Simulator

We use mental simulation for much of our decision making and problem solving. When confronted with a problem or decision, we begin with what initially appears to be the best course of action. We then mentally simulate the likely outcome of that course of action using a mental model. If the mental simulation results in an undesirable outcome, then we analyze our course of action for the problem, and then mentally simulate an updated course of action. We repeat this process until we arrive at a suitable outcome.<sup>10</sup> Such was the case on 15 January 2009 in what came to be known as “The Miracle on the Hudson.”

At 3:25 p.m., Flight 1549 took off from New York’s La Guardia Airport under the command of Captain Chesley “Sully” Sullenberger. Two minutes after takeoff, at an altitude of only 3,200 feet, Captain Sullenberger’s Airbus 320 passed through a large flock of birds, some of which entered and stopped both of the aircraft’s engines. The heavy Airbus rapidly began to slow and lose altitude. Captain Sullenberger needed to land immediately.

Captain Sullenberger’s first course of action was the one that all pilots learn from the beginning of flight training: turn around and return to the airport. He immediately made the request to air traffic control:

*Sullenberger:* Uh, this is uh, Cactus fifteen thirty nine [sic]. Hit birds, we’ve lost thrust in both engines, we’re turning back towards LaGuardia.

*Air Traffic Control:* Ok, uh, you need to return to LaGuardia? Turn left heading of uh, two two zero.<sup>11</sup>

At this point Captain Sullenberger ran a mental simulation of his flight path to LaGuardia airport. He recalled:

I quickly determined that due to our distance from LaGuardia and the distance and altitude required to make the turn back to LaGuardia, it would be problematic reaching the runway, and trying to make a runway I couldn't quite make could well be catastrophic to everyone on board, and persons on the ground. And my next thought was to consider Teterboro [Airport].<sup>12</sup>

Captain Sullenberger ran a second mental simulation, this time of his flight path to nearby Teterboro Airport, and concluded that Teterboro was out of reach as well. Captain Sullenberger ran a third mental simulation, this time to the Hudson River. He recalled, "The only viable alternative, the only level smooth place sufficiently large to land an airliner was the river."<sup>13</sup> Upon deciding to land in the Hudson, Captain Sullenberger mentally simulated the landing to anticipate potential problems:

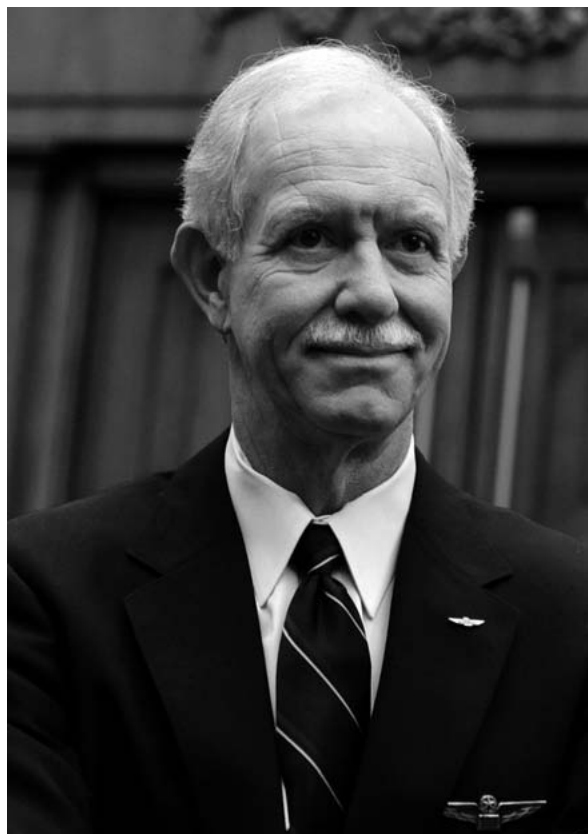
I needed to touch down with the wings exactly level. I needed to touch down with the nose slightly up. I needed to touch down at a descent rate that was survivable. And I needed to touch down just above our minimum flying speed but not below it. And I needed to make all these things happen simultaneously.<sup>14</sup>

One of the reasons Captain Sullenberger was able to successfully save all the souls aboard Flight 1549 is because he had practiced engine failures in a flight simulator. Captain Sullenberger was able to draw on his experiences in the flight simulator to rapidly and accurately simulate the likely outcomes of a return to La Guardia, a diversion to Teterboro, and ultimately a landing in the Hudson River. The richness of Captain Sullenberger's mental models enabled him to make a good decision based on good mental simulations.

Unlike flying airplanes, most everyday situations do not have a computer simulator. However, we are effectively stepping into a simulator of ideas when we write. According to author Janet Emig, "Writing

connects the three major tenses of our experience [past, present, and future] to make meaning. And the two major modes by which these three aspects are united are the processes of analysis and synthesis."<sup>15</sup> In other words, writing connects ideas and facts in a relational and temporal sense, creating rich patterns for use by our pattern-recognizing brain.

When we write, we are essentially composing a story through a series of mental simulations of facts, ideas, and relationships. Authors Chip and Dan Heath assert that "stories are like flight simulators for the brain."<sup>16</sup> The reason is that we cannot think about a story without mentally simulating it. Research suggests that mentally simulating an event activates the same parts of the brain as actually experiencing the same event. In one study, subjects who imagined tapping on their skin activated the area of the brain associated with tactile perception. Subjects who imagined a flashing light activated the visual perception area of



Captain Chesley B. Sullenberger, III, the pilot who safely landed a jetliner in New York's Hudson River 15 January 2009, waits to testify on Capitol Hill in Washington, 24 February 2009.



the brain.<sup>17</sup> In fact, mental simulation is so powerful it can actually improve physical performance. A study of more than 3,000 subjects revealed that mentally practicing tasks, such as playing a musical instrument or figure skating, delivered an average of 66 percent of the performance improvement benefits of actual physical practice.<sup>18</sup>

While we mentally simulate stories about ideas and relationships in our writing, our mental models simultaneously become richer and more accurate. Our brain becomes better at simulating likely outcomes, which makes us better problem solvers, decision makers, and ultimately better thinkers. Like a pilot in a flight simulator, time spent writing is akin to practicing thinking in a thinking simulator. Just as a pilot can replay a flight simulation to evaluate his or her performance, so too can writers critically examine their own thinking from multiple perspectives.

## A Word on PowerPoint

To write coherently about an idea is to achieve an intimate understanding of that idea through mental simulation. Composing a coherent narrative requires the writer to unambiguously describe the nature of ideas and relationships—causal, corollary, or otherwise.<sup>19</sup> One simply cannot write well without attaining a thorough understanding of the subject matter.

On the other hand, it is relatively easy to produce a PowerPoint presentation without clearly understanding the subject matter. We can cut, paste, and rearrange bullet statements to produce the illusion of thinking and understanding. PowerPoint briefings often circulate within organizations as standalone communications, which can lead to misinterpretation of ideas. Retired Marine Corps Colonel T.X. Hammes lamented the widespread use of PowerPoint in an *Armed Forces Journal* essay entitled “Dumb-dumb bullets.” Hammes argues that writing is a better method of communicating ideas than passing around slideshows:

Most of the people who actually see the brief get an incomplete picture of the ideas presented. Some briefers attempt to overcome this by writing whole paragraphs in the briefing notes portion of the slide. Clearly, a paper is a better format than PowerPoint. If the concept requires whole

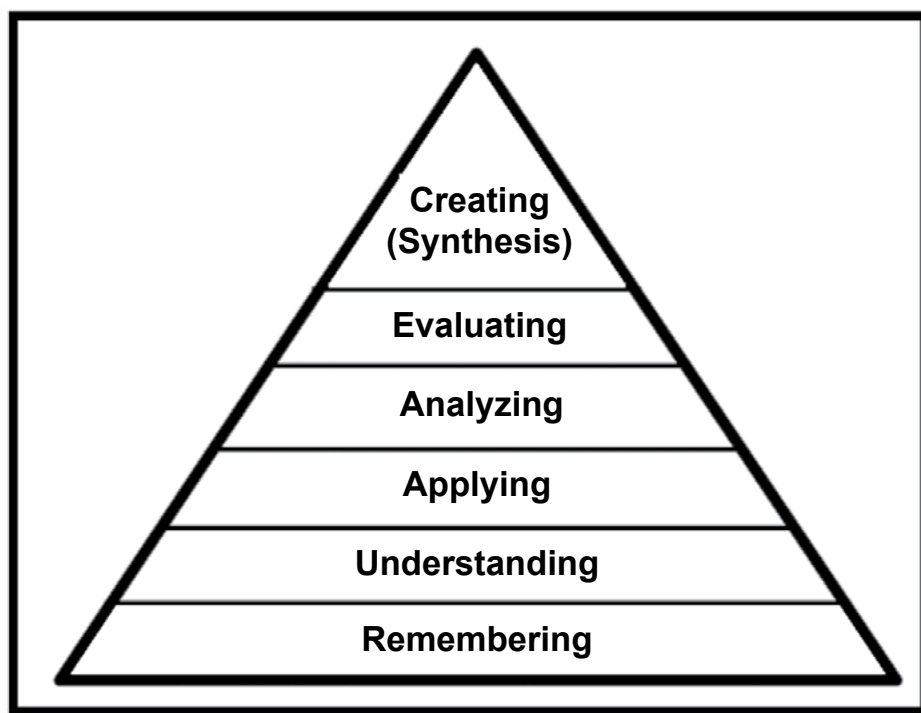
paragraphs—and many do—then they should be put in an appropriate paper and provided ahead of time.<sup>20</sup>

Empirical research supports Hammes’ idea that fragmented ideas, such as the bullet statements and briefing notes often found in PowerPoint, are not as effective as writing when it comes to learning. George E. Newell from the University of Kentucky examined how well students learned based on whether they took notes, wrote short answer responses to study questions, or wrote complete essays. The three methods examined in Newell’s study provide a good analogue to compare PowerPoint against staff studies and similar written products. Note taking and short answer responses are similar to bullet statements and briefing notes from PowerPoint, respectively, while essay writing is similar to staff papers.

Newell found that writing essays enabled students to “produce a consistently more abstract set of associations for key concepts than did note taking or answering study questions.”<sup>21</sup> Newell suggests the integrative nature of essay writing is responsible for the superior learning.

[When] answering study questions . . . the writer can only consider information in isolated segments. Consequently, while a great deal of information is generated, it never gets integrated into a coherent text, and, in turn, into the students’ own thinking. Essay writing, on the other hand, requires that the writers . . . integrate elements of the prose passage into their knowledge of the topic rather than leaving the information in isolated bits.<sup>22</sup>

Bloom’s *Revised Taxonomy of Learning* (see figure) supports Newell’s theory and provides an insight into why PowerPoint is not effective as a medium for thought. Writing is a dialectic process of both analysis and synthesis.<sup>23</sup> Analysis, the process of breaking up ideas into smaller ideas, sits in the middle of Bloom’s *Taxonomy*. In contrast, synthesis, the process of putting together ideas to form larger ideas, mental models (patterns), and even new ideas, is the highest level of cognitive learning.<sup>24</sup> When we write, we are constantly analyzing ideas in lower-order cognitive processes, then we try to make different ideas make sense in the higher-order synthesis process. PowerPoint demands no



**Bloom's Revised Taxonomy of Learning**

such cognitive foray into the synthesis realm. The bullet statements of PowerPoint are products of simple analysis, independent bits of data free of the context and the broad story arcs our brain needs to build mental models. Granted, a skilled briefer can provide the needed synthesis for the slides to make sense; however, unlike writing, the medium itself does not force synthesis. Furthermore, the slides are often distributed as a standalone product, with no accompanying briefer to provide needed context.

This analysis-synthesis dialectic is central to thinking and decision making in a competitive environment. The great American strategist Colonel John Boyd called this process a “Dialectic Engine,” which he describes in his essay “Destruction and Creation”:

[W]e can forge a new concept by applying the destructive deduction and creative induction mental operations. Also, remember, in order to perform these dialectic mental operations we must first shatter the rigid conceptual pattern, or patterns, firmly established in our mind.

Next, we must find some common qualities, attributes, or operations to link isolated facts, perceptions, ideas, impres-

sions, interactions, and observations together as possible concepts to represent the real world. Finally, we must repeat this unstructuring and restructuring until we develop a concept that begins to match-up with reality. By doing this, we find that the uncertainty and disorder generated by an inward-oriented system talking to itself can be offset by going outside and creating a new system. Simply stated, uncertainty and related disorder can be diminished by the direct artifice of creating a higher and broader more general concept to represent reality.<sup>25</sup>

Boyd theorized that in a competitive realm, the competitor who could conduct this mental process of destruction and creation quicker and with more accuracy than the opponent would ultimately prevail.<sup>26</sup> Today, we refer to this as “getting inside our opponent’s decision cycle.”

Boyd’s interplay of deduction and induction effectively describes the cognitive process of writing. Writing requires the author to fire up his or her dialectic engine, but more than that, it allows the author to critically examine the functioning of that engine as the results of the cognitive processes are

put on paper. Boyd's ideas fit together with Emig's description of writing as a connecting process that connects past, present, and future through analysis and synthesis.<sup>27</sup>

Clearly, formal writing is the best way to promote clear thinking among Army officers. Furthermore, the Army's current PowerPoint cut-and-paste paradigm is undermining the ability of our officers to synthesize and think clearly about critical issues. To solve this problem, Army leaders need to bring writing back to the forefront as a critical leadership skill.

## Toward a Writing Renaissance

An obvious place to start a renaissance in writing is our officer education system. Although field grade officers are routinely required to write in courses at the Command and General Staff College and the Army War College, company grade officer courses are less focused on writing. We need to remedy this by requiring officers to routinely write from the very beginning of their careers. Writing needs to be a part of every officer education course beginning at precommissioning and continuing through the Officer Basic Course and Captain's Career Course.

Professional journals are a fantastic medium for officers to share thoughts and experiences through writing. Commanders should encourage their officers to write and submit articles to these publications. Admiral James Stravidis encourages officers of all ranks to write for publication:

Dare to read and develop your understanding. Carve out the time to think and form new ideas. Dare to speak out and challenge assumptions and accepted wisdom if your view differs from them. Have the courage to write, publish, and be heard. Launch your ideas and be an integral part of the conversation.<sup>28</sup>

Commanders should establish professional writing programs alongside their professional reading programs. The Army officer corps has a robust professional reading tradition. Our senior leaders publish professional reading lists to guide leaders in their reading endeavors. Many unit commanders also publish reading lists. Unfortunately, our professional writing ethic is not nearly so robust—unfortunate because writing, when combined with reading, produces powerful thinking.

***... we need to bring good writing back as a visible part of day-to-day Army operations. Cleaning up email is a necessary step.***

Research has shown that reading and writing together produces better thinking than reading or writing alone. In one study, researchers assigned 137 college students to read about a subject, write about a subject, or do both. The researchers found that students who both read and wrote did more critical thinking and were more willing to shift their perspective on the subject than students who only read or only wrote. The researchers concluded that reading and writing together form a "symbiotic" relationship, which leads to better thinking.<sup>29</sup>

Finally, we need to bring good writing back as a visible part of day-to-day Army operations. Cleaning up email is a necessary step. Leaders at all levels should demand clean, clear, and concise email correspondence. We need to integrate formal writing back into our staff work as well. Commanders should consider requiring staff officers to produce written papers to address key issues in lieu of cut-and-paste slide shows. Leaders should relegate PowerPoint to its rightful place as a secondary tool augmenting the primary communication mediums of writing and discussion.

The contemporary operating environment demands Army officers who can think creatively and critically. Writing can help them build these thinking skills. Writing is more than a simple means of expressing thought; it is a means of creating thought. However, the decline of writing within the Army officer corps, combined with over-reliance on PowerPoint and email, is a threat to clear and critical thinking. Army officers must return to writing as a primary means of communicating. Whether in professional journals, staff papers, or other venues, the return of writing to the forefront will ensure the officer corps has the communication and thinking skills necessary to effectively lead our Army. **MR**

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c. Total Paid and/or Requested Circulation (Sum of 15b (1), (2), (3), and (4))		8,448	
d. Non-requested Distribution (By Mail and Outside the Mail)		8,070	
(1) Outside County Nonrequested Copies Stated on PS Form 3541 (Include Sample copies, Requests Over 2 years old, Requests initiated by a Premium, Bulk Sales and Requests including Association Requests, Names obtained from Business Directories, Lists, and other sources)		0	
(2) In-County Nonrequested Copies Stated on PS Form 3541 (Include Sample copies, Requests Over 2 years old, Requests initiated by a Premium, Bulk Sales and Requests including Association Requests, Names obtained from Business Directories, Lists, and other sources)		0	
(3) Nonrequested Copies Distributed Through the USPS by Other Classes of Mail (e.g. First-Class Mail, Nonrequested Copies mailed in excess of 10% limit mailed at Standard Mail® or Priority Service®)		0	
(4) Nonrequested Copies Distributed Outside the Mail (Include Pick-up Stands, Trade Shows, Showrooms and Other Sources)		0	
e. Total Nonrequested Distribution (Sum of 15d (1), (2), (3) and (4))		0	
f. Total Distribution (Sum of 15c and 15e)		8,448	
g. Copies not Distributed (See Instructions to Publishers #4, (page K3))		0	
h. Total (Sum of 15f and g)		8,448	
i. Percent Paid and/or Requested Circulation (15c divided by 15h times 100)		100%	
16. Publication of Statement of Ownership for a Requester Publication is required and will be printed in the <b>Nov/Dec 2011</b> issue of this publication.			
17. Signature and Title of Editor, Publisher, Business Manager, or Owner <b>Colonel John J. Smith, Director, Military Review</b> Date <b>30 Sep 11</b>			

## USPS Statement of Ownership 2011