

# Historic Book Review

## John Boyd and Air Power Theory

Reviewed by Air Cdre Neville Parton

It could be argued that this book review is the odd-man out in the series, as it could not, by definition, actually relate to a book produced by John Boyd, as he was famous (or infamous) for never committing his thoughts to paper. However, it is almost impossible to conceive of a series examining the way in which thinking about air power has developed over the last ninety years or so that does not include Boyd and his theories related to air power. Furthermore, recent research shows that whilst he did indeed seem to prefer oral briefings, he also produced a number of papers which do provide significant insights into his beliefs regarding air power and air warfare. This review is therefore based upon three books about Boyd and his ideas, together with a number of short articles and papers that he did write.<sup>1</sup> As with the other reviews in this series, it seeks to put into context both the individual and his theories, and in this particular case to explain why it was that John Boyd was so reluctant to expose his thoughts in a formal publication, together with an assessment of whether this helped or hindered his cause. Perhaps more importantly, it should interest all those who want to understand how original thought in a military context is generated, as Boyd's story is, at times, almost too

incredible to be believed.

So let us begin by considering the man behind the theories. John Boyd was an incredibly gifted fighter pilot, air tactician and military strategist, as well as a hugely patriotic individual.



*Col John Boyd  
in his days as  
a Korean War  
Fighter pilot.*

John Boyd was a bombastic loud-mouth with a bullying personality, deeply anti-authoritarian in nature, prone to gross over-exaggeration, and cared little for other than that which he held to be true. Both of these statements are undeniably accurate, and perhaps an estimate of the true nature of Boyd can be determined from the fact that a single person could generate such widely differing perceptions. He was, without doubt, a larger-than-life personality, and it is likely that any psychologist would have a field-day relating his personality traits to his early upbringing.

Born in Erie, Pennsylvania in 1927, his family situation was relatively comfortable until his father died

when John was three years old, leaving a family of five children to be raised during the Great Depression. Boyd's mother was focussed on keeping up appearances, but had a number of issues besides the lack of income to deal with, including a daughter who developed polio, and a son (John's elder brother) who developed schizophrenia and died as a consequence, all of which resulted in her encouraging the children to keep their family affairs extremely private. At High School, Boyd was quite athletic, although at best an indifferent scholar, and he became a keen swimmer and lifeguard in his spare time but with no clear view on what he wanted to do later on in life – other than succeed. The Second World War perhaps provided a fortuitous intervention, in that John then left to join the US Army Air Corps as a gun-turret mechanic, having been rejected as a pilot due to a lack of aptitude. The end of the war meant that he became part of the US occupation forces in Japan, but employed in a range of 'filler' posts, which lasted until he was discharged in 1947. It was during this period that the first of the John Boyd 'stories' emerged which starts to give an indication of some of his particular personality traits. Without going into overmuch detail, this involved Boyd and a number of fellow privates dismantling wooden hangars during a bitter winter in Japan to provide them with fuel, as they had no proper accommodation and no heating. When discovered and threatened with court-martial, Boyd was able to overturn the charges by pointing to fundamental derelictions of duty amongst the officers in charge.<sup>2</sup> Fundamentally, Boyd loved to portray

himself as the underdog who was able to overcome the system by force of personality and always being in the right.<sup>3</sup> Following his return to civilian life, Boyd then took advantage of the provision for education within the GI Bill, and attended the University of Iowa to read for a degree in economics.



*T-6 Texan circa 1950.*

Boyd's interest in the Air Force had obviously not been dampened by his early experience, and he joined the Reserve Officers Training Course (ROTC) whilst at Iowa, although he maintained at the time that he did so only for the extra income it afforded him. After graduation in 1951 he immediately joined the USAF full-time, and during his basic flying training on the T-6 some of the attributes that would be associated with him throughout his later life could be discerned – in particular a willingness to operate outside the rules. Of course this could be another example of exaggeration, but the evidence suggests that he often operated aircraft outside the cleared envelope from the very beginning of his flying career, regarding this as fundamental to the role of being a good fighter pilot – which even then was what he was determined to be. He excelled throughout his flight

training, on the T-6, then the F-80, and finally the F-86, where he was considered competent enough to be posted direct to a combat unit during the Korean War.



*F-86 Sabres in Korea.*

So it was that in early 1953, Boyd was posted to the 51st Fighter Interceptor Wing in Korea. Here though, as in the Second World War, he had arrived effectively too late for the active part of the conflict, flying 22 combat sorties but with nothing to his name other than being credited with damaging a MiG-15. It might have been very different, but for a theatre rule that element leaders were the 'shooters' in this conflict, and it required 30



*Russian mechanics working on a MIG-15 during the Korean War, 1952.*

missions before an individual would be made an element leader – and the ceasefire was signed before he

reached that magic number. After hostilities had ceased, the F-86 squadrons began practicing air combat, and Boyd's prowess resulted in his being appointed as a flight commander and tactics instructor for his squadron. The latter led to colleagues asking him to put down his ideas in diagrams, and he began to teach combat tactics in classes: the assessment of his performance and abilities that resulted led, almost inevitably, to a posting to the Fighter Weapons School (FWS) at Nellis AFB, where he was to serve for six years, and during which time the 'myths' would begin to grow taller.



*Nellis Air Force Base part of Air Combat Command (ACC).*

It was during this period that he gained the sobriquet of '40-second Boyd' or 'Pope John', relating to his role as an instructor at FWS, where he had a standing bet for all comers: the challenger would begin on Boyd's tail, and within forty seconds Boyd would be on the challenger's tail – the loser to pay out forty dollars. In six years he never lost the bet.<sup>4</sup> It was towards the end of his time at Nellis, however, that he first produced a serious piece of work, with the assistance of Vernon Spradling, the FWS's lynchpin, and a dictaphone. Written in his own

time and based upon his work as an instructor and detailed analysis of contemporary aircraft and weapons, Boyd's Aerial Attack Study quickly became the official USAF tactics manual for fighter aircraft, and resulted in the personal award of a Legion of Merit. John Boyd was not content with the manual though, as he felt that there was something missing – and his next assignment would provide the breakthrough that he was seeking.

Indeed the next two years would prove to be perhaps the most formative in Boyd's life. Whilst not many can claim to have had fundamental insights into the nature of warfare as a result of attending engineering classes as an undergraduate, that is exactly what happened to Boyd during his time at Georgia Technical University from 1960 to 1962, and would lead to his first major piece of original work. His 'Damascus Road' moment came whilst trying to understand the concept of entropy in thermodynamics, and eventually led to his 'Energy-Manoeuvrability Theory' (E-M theory), for which he and his co-author, Tom Christie, would receive the U.S. Air Force Scientific Achievement Award for 1964. Without getting too much into detail, E-M theory provided a way in which the combat performance of aircraft could be compared in a meaningful way, and allowed far more detailed specification of what was required from an aircraft in terms of performance.<sup>5</sup> This single piece of work – and the insights into aircraft performance that Boyd drew from it – would dominate his life over the remaining 11 years of his career. The years that followed, until

Boyd's retirement from the USAF in 1975, saw him engaged in constant combat with bureaucracy over the need to develop a 'proper' fighter aircraft for the USAF, which began with the F-X programme that would eventually result in both the F-15 and F-16. Space does not permit a detailed exposition of Boyd's part in this development, nor of his period in command of a task force at Nakhon Phanom AFB in Vietnam (complete with further Boyd myths), but it would be impossible to underestimate the role that Boyd played in the development of the F-16 in particular, and of the Military Reform Movement in general.<sup>6</sup>



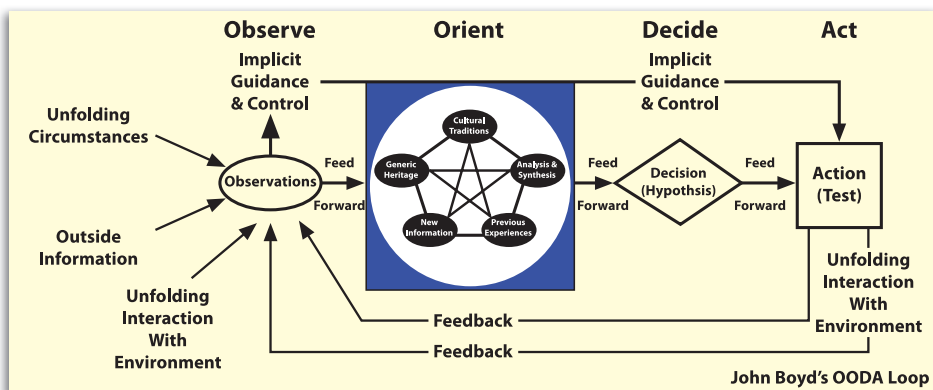
*Two USAF F-15s head on.*

However, it was in the years that followed his resignation from the Air Force that Boyd's ideas on warfare at a more general level really began to take shape. This was largely as a result of Boyd continuing his own education but in ever more disparate areas; he told his friends that what

he was working on was an attempt to produce work which would "... link Godel's Proof, Heisenberg's Uncertainty principle and the second law of thermodynamics."<sup>7</sup> The end result was *Destruction and Creation*, one of the few genuine papers that Boyd ever produced - although it was never formally published.<sup>8</sup> *Destruction and Creation* would be subject to revision to the end of John Boyd's life, and was concerned with the way in which creativity occurred in the human mind - and how this could result in confusion and disorder if there was a mismatch between a concept or idea and observed reality.<sup>9</sup> This basic thought would underpin his next piece of work, which was applying the insights from *Destruction and Creation* to an operational issue, resulting in the *Patterns of Conflict* briefing - and the OODA Loop. Boyd's life would now be consumed by the need to perfect the concepts contained within *Patterns of Conflict*, and to make others understand - and use - the insights that they provided. This was the path which led to the infamous and ever-lengthening briefing sessions, with constant revisions to the content.<sup>10</sup> The final evolution, which attempted to sum

up all of his work, was entitled *A Discourse on Winning and Losing*, and involved 14 hours worth of briefings delivered over a 2-day period.

The most detailed analysis of Boyd's theories is provided in Osinga's book on *Science, Strategy and War*, where most of the content is related to analysing the core arguments in Boyd's work, and considering their origins.<sup>11</sup> Even a cursory examination quickly reveals that the schematic OODA-loop is a gross over-simplification of Boyd's ideas, which contained a great deal more insight, and provide much more food for thought, than is perhaps generally understood. Certainly simply getting inside an enemy's OODA loop is not what John Boyd had intended people to take away from his ideas - and perhaps why he insisted on only explaining the concepts in person, through the highly interactive medium of a briefing. Although *A Discourse on Winning and Losing* was never fully written up, enough remains to be able to understand that Boyd was more interested in how people and organisations learn and adapt, and how vitally important - in fact fundamental - the element



Full diagram originally drawn by John Boyd for his briefings on military and fighter pilot strategy.

of *orientation* was. Furthermore, the issue of tempo was relative not absolute, and thus it was the speed of *correct* decision making that was important, with the aim of consciously generating mismatches between the events that an enemy observes or anticipates, and those that he must react to. Drawing heavily on military strategists from Sun-Tzu to Liddell-Hart, and rejecting much of Clausewitz along the way, Boyd was a firm believer in using the manoeuvrist approach to create those mismatches and uncertainty, and many of his ideas certainly appear in current thinking on 4<sup>th</sup> generation warfare (4GW).<sup>12</sup>

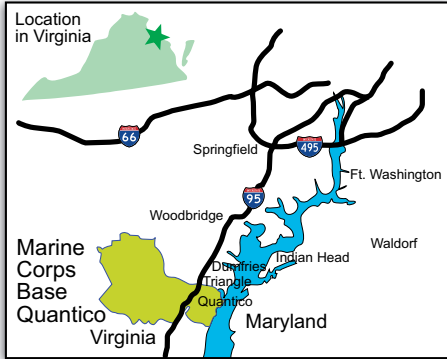
We do still need to address the question posed at the start of this article though, regarding the effect on Boyd's ideas of never having properly committed them to paper. Boyd has been described as perhaps the first post-modern strategist, and has left a "... sophisticated, multi-layered and multidimensional legacy and a new set of terms and concepts to study conflict that is useful, if at places abstract, biased, cryptic and difficult to fathom."<sup>13</sup> Would it have been any different if he had produced well-laid out, academically respectable papers? Having read widely about Boyd, it is difficult to avoid reaching the conclusion that if he had been the kind of person who had produced lengthy written papers, he would not have been the person who came up with the concepts that he did, nor had the energy and drive to force them to be taken seriously by the establishment.

The most difficult question posed by John Boyd though from the perspective of any air force, and

one which will be returned to later on in this series when Warden's *Air Campaign* is examined, is what do military bureaucracies do when faced with mavericks? Boyd was, without doubt, a highly complex character, with many distinctive traits – some impressive, whilst others were less desirable. A deep thinker, but often 'anti-intellectual'; hugely gregarious – but also intensely private; someone who inspired many and made converts ('acolytes') of a few – although he also made a significant number of enemies; and was someone who held grudges for a long time. And whilst he could be absolutely correct in his analysis, he would often deliberately refuse to see the wider picture, preferring to concentrate on reducing all struggles to black and white issues. Yet without his insight and keen analytical ability, both the USAF and the broader military community would have been denied not only techniques to allow fighter aircraft designs to be better optimised but also remarkable new ways of thinking about the very nature of conflict. Indeed, it is hard to think of an officer who has made so many original contributions to any armed service, but despite this, within the USAF Boyd was more vilified than praised – a direct reflection on the way that he operated.

Perhaps the most accurate way of summing up the way in which Boyd was regarded by his own Service is to consider how he was initially remembered, which was solely by the naming of a small building at Nellis Air Force Base (AFB), used by the crews acting as aggressors in the Red Flag exercises.<sup>14</sup> By way of contrast, in the US Marine Corps Research Center at Quantico there

was (and still is) a large display case containing Boyd's flight suit, medals and logbooks, and his papers are all contained within the Marine Corps library.<sup>15</sup> In fact, there were more



*Location of US Marine Corps Base, Quantico.*

representatives at John Boyd's funeral service from the other branches of the armed force than there were from the USAF.<sup>16</sup> However, it is worth noting that Boyd's reputation has been considerably reassessed during the last two years, to the point where the Secretary of Defense, Robert M. Gates, praised Boyd during a speech in 2008 at Maxwell AFB as an individual whose commitment and integrity should be emulated by those aspiring to truly serve their nation.<sup>17</sup>



*Official portrait of Secretary of Defense, Robert M. Gates.*

Given that this edition of Air Power Review is majoring on the 'space' theme, you could be forgiven for asking what relevance an individual

like Boyd, who had such clear contempt for the US astronaut corps for instance, has to the subject.<sup>18</sup> However Boyd demonstrated, throughout his life, the ability to take information, deconstruct it, and synthesize it in new ways – and the results were dramatic, had tremendous impact, and are still with us today. If we are to succeed in making the most of the opportunities that space has to offer, we either need more Boyd-like characters, or the ability to use his insights into critical thinking to make sure that we have all genuinely understood the advantages that operating in this environment can bring. Moreover his identification of manoeuvre warfare as being the optimal paradigm for warfare also provides a test, in that air forces, being largely technology-driven and technology-dependent, have an innate leaning towards a Jominian approach, with its focus on force and kill ratios, centralized control, detailed planning and a 'scientific' approach to warfare. In an era when the dominant form for enemies is in the shape of terrorist or guerrilla organisations, who are sustained by a very different understanding of warfare, the need to understand the manoeuvrist approach is clear. Boyd's personal story should act as both a reassurance and challenge to all those of us who believe in air and space power. A reassurance in that anybody can, if they really believe in what they are doing, make a difference – and that difference can be out of all proportion to an individual's actual place within an organisation. A challenge that we all need to ask ourselves is do we have the innate honesty and integrity to stand up to the system if we believe that we are in the right?

## Note

There are a significant number of books that have been written both about Boyd, and his theories. Indeed, the number of publications that seek to apply the ideas contained within the OODA-loop theory seems to go on growing, particularly within the genre of military-theory related books for business, on which the English-speaking business world seems to thrive. However, for anyone wanting to get an understanding of John Boyd as an individual then either of the books by Grant Hammond or Robert Coram are sufficient – and both are a good read – albeit it should be noted that both are also written by Boyd supporters! For anyone wanting a greater understanding of the ideas underpinning Boyd's theories, the academic analysis provided in Frans Osinga's publication is excellent – albeit not quite so accessible. The remaining two, detailed below, can be taken as representing the genres of applying Boyd's ideas more widely to the fields of strategy and business respectively.

## Bibliography:

Coram, Robert. *Boyd : The Fighter Pilot who Changed the Art of War*. Boston: Little, Brown and Company, 2002.

Hammond, Grant T. *The Mind of War: John Boyd and American Security*. Washington: Smithsonian Institution Press, 2001.

Osinga, Frans P.B. *Science, Strategy and War : The Strategic theory of John Boyd*. London: Routledge, 2007.

Lind, William S. *Maneuver Warfare Handbook*. Boulder, Colorado: Westview Press, 1985.

Richards, Chet. *Certain to Win: The Strategy of John Boyd, Applied to Business*. Philadelphia: Xlibris Corporation, 2004.

## Notes

<sup>1</sup>With the exception of a short paper on energy management produced in 1961.

<sup>2</sup>One biographer relays this as gospel, whilst another notes that it was 'difficult to believe'. All those who mention it do so in the context of his perennial belief in making a principled stand.

<sup>3</sup>If all the stories relayed by biographers are to be believed, John Boyd was also responsible for the desegregation of Las Vegas, identifying a fundamental design flaw in the F100 when he threw one away whilst aggressively manoeuvring it, and stopping the careers of a number of generals. His nickname in later years was 'hoser', from his penchant for describing having defeated individuals within the Pentagon, all at rank levels superior to his own, as having been 'hosed' – from the use of the term to indicate having succeeded in filling an enemy aircraft with machine-gun or cannon fire.

<sup>4</sup>Robert Coram, *Boyd : The Fighter Pilot who Changed the Art of War* (Boston: Little, Brown and Company, 2002), pp.87 - 89.

<sup>5</sup>The basic equation in E-M theory is  $P_s = [T-D/W]V$ , where  $P_s$  = specific energy rate, T = thrust, D = drag, W = weight and V = velocity – this gives a method of analysing how much excess energy a platform possesses – which can then be used to determine how much performance in terms of acceleration, or the ability to climb or turn, an aircraft has at any point in its flight envelope.

<sup>6</sup>See Coram, *Boyd : The Fighter Pilot who Changed the Art of War*, ch, 22 and 23.

<sup>7</sup>*Ibid.*, p 321.

<sup>8</sup>Although a version can be found



online at [http://www.goalsys.com/books/documents/DESTRUCTION\\_AND\\_CREATION.pdf](http://www.goalsys.com/books/documents/DESTRUCTION_AND_CREATION.pdf)

<sup>9</sup>Boyd's aim was to provide some independent scientific or logical proofs to back up his ideas, although what he actually provides are examples of scientific theories which can be used as metaphors for better understanding the nature of human systems. See Grant T. Hammond, *The Mind of War : John Boyd and American Security* (Washington: Smithsonian Institution Press, 2001), ch. 8.

<sup>10</sup>The different versions were referred to by a major heading (Warp I, Warp II etc. – after the Star Trek series) and a minor heading (Wicker 1, Wicker 2 etc). So there were a range of variants between Warp I and Warp XII – after which he simply referred to it as *Patterns of Conflict*. Coram, *Boyd : The Fighter Pilot who Changed the Art of War*, p 328.

<sup>11</sup>Frans P.B. Osinga, *Science, Strategy and War : The strategic theory of John Boyd* (London: Routledge, 2007).

<sup>12</sup>*Ibid.*, ch. 7.

<sup>13</sup>*Ibid.*, p. 255.

<sup>14</sup>Albeit there was an indirect remembrance at Maxwell AFB, where the small circular road outside the doctrine centre had been formally named as 'The OODA Loop.'

<sup>15</sup>The US Marine Corps contacted John Boyd's family within 48 hours of his death in 1997, offering to provide a home for his papers.

<sup>16</sup>Hammond, *The Mind of War : John Boyd and American Security*, p 203.

<sup>17</sup>See transcript at <http://www.defenselink.mil/transcripts/transcript.aspx?transcriptid=4214>

<sup>18</sup>Because they weren't fighter pilots!



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