

STOVL: The Best Future for Marine Air

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STOVL: The Best Future for Marine Air  
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## Report Documentation Page

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## INTRODUCTION

The USMC is scheduled to replace its AV-8B Harriers and F/A-18 Hornets with the F-35 Joint Strike Fighter (JSF) starting in 2010. However, given the advent of tactical aviation (TACAIR) integration with the U.S. Navy, it has not been decided if the USMC will buy only the Short Takeoff Vertical Landing Version (STOVL) or a mixture of STOVL and Carrier Versions (CV) of the JSF.<sup>1</sup> The U.S. Marine Corps should purchase only the STOVL variant of the JSF to fulfill its fixed-wing TACAIR requirement due to its abilities to offer greater flexibility, long-term savings, and Sea Basing support.

## STOVL HISTORY

Since the introduction of the AV-8A Harrier into the USMC, the United States Navy (USN) has continually rejected incorporating STOVL aircraft into the Carrier Air Wing. For example, despite the successful deployment of an entire squadron of AV-8As with Carrier Air Wing 19 for seven months aboard the USS Franklin D. Roosevelt (CV-42), a shockingly disparaging report was submitted by the carrier.<sup>2</sup> Some Navy officials feared that further introduction of STOVL aircraft would reduce the need for large carriers, the center pieces of the naval fleet.<sup>3</sup>

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<sup>1</sup> Bill Sweetman, "UK choice critical for JSF STOVL variant," *Interavia* 57, no. 665 (Jul-Aug 2002): 53.

<sup>2</sup> Charles H. Brown, "Up, Up and Away," *U.S. Naval Institute*. August 2003, <http://www.usni.org/proceedings/articles01/probrown8.htm> (8 January 2004).

<sup>3</sup> Brown.

In 1980, a study by the American Institute of Aeronautics and Astronautics (AIAA) "concluded that V/STOL aircraft provide better mission performance at sea with fewer aircraft."<sup>4</sup> The report's reasoning for the advantages of the V/STOL aircraft was the fact that a greater number of sorties could be generated in a given period of time.<sup>5</sup> Despite this favorable information towards V/STOL integration into Carrier Air Wings, when plans were made to integrate an AV-8B squadron into an aircraft carrier's cruise in the late 1980's, the USN's leadership quickly stopped the proposal.<sup>6</sup> However, if the USMC only buys the STOVL JSF, the USN would be forced to integrate its Carrier Air Wings with STOVL aircraft.

#### CV vs STOVL

The USMC's strongest case for only buying the STOVL model is the flexibility it provides by operating off of a shorter runway. The STOVL JSF, like the Harrier, will be able to operate from Navy amphibious ships and conventional aircraft carriers, "effectively doubling the number of platforms from which they can operate."<sup>7</sup> This flexibility will provide MAGTF commanders with the ability to increase the number of fixed wing

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<sup>4</sup> Maj Andrew G. Shorter, "STOVL JSFs Put Teeth in Sea Basing," *U.S. Institute Proceedings* 129, no. 9 (Sep 2003).

<sup>5</sup> Shorter.

<sup>6</sup> Brown.

<sup>7</sup> LtCol Arthur Tomassetti, "A Leatherneck JSF is just right," *U.S. Naval Institute Proceedings* 128, no. 9 (Sep 2002).

aircraft available to support their schemes of maneuver. This flexibility also applies to land-based operations, since the smaller runway required for operations by STOVL aircraft opens airfields that other aircraft cannot use. The positioning of aircraft closer to their targets reduces reaction time for aircraft, which is very important during close air support (CAS). MCDP 1 states that "speed over time is tempo-the consistent ability to operate quickly...In other words, speed is a weapon."<sup>8</sup> Consequently, STOVL aircraft are able to use speed as an additional weapon, reaching a greater number of targets in a shorter time period.

STOVL aircraft abilities to operate closer to the objective also allow for an increased number of sorties to be generated per aircraft per day. According to JSF requirements, the STOVL version must be able to sustain three sorties per day and surge to four, while the CV version is only required to sustain two sorties and surge to three.<sup>9</sup> The capability to fly an increased number of sorties with the same amount of aircraft more than offsets the slight performance loss the STOVL JSF suffers in both internal payload and range over the CV variant. The STOVL JSF sacrifices two 2000 lb JDAM for two 1000 lb JDAM.<sup>10</sup> However, "if we have a precision weapon that hits the target, we do not

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<sup>8</sup> U.S. Department of the Navy, *Marine Corps Doctrinal Publication 1* (Washington D.C., 1997), 94

<sup>9</sup> *JSF*, < <http://www.jsf.mil/IEFrames.htm> > (8 January 2004).

<sup>10</sup> Tomassetti.

need as much explosive."<sup>11</sup> The CV version is required to have at least a 150 nm greater range than the STOVL version using internal fuel only.<sup>12</sup> The USN's reluctance to position its conventional carriers in the littorals requires that CV based aircraft have an increased range. Therefore, by positioning STOVL aircraft closer to the target area, its minor disadvantages can be minimized, and its advantages can be maximized.

Another advantage the STOVL JSF will have over CV versions is its landing safety abilities aboard ship, given that "it is much easier and safer to stop and land, rather than land and stop, an airplane."<sup>13</sup> During the Falklands campaign, when the British were forced to place Royal Air Force pilots and aircraft on their ships, they discovered that:

V/STOL aircraft negate the greatest danger of fixed-wing shipboard operations-the speed at which the aircraft approaches the ship when landing-and can use normal land-based confined-area landing techniques to safely land on any suitable sized deck at sea.<sup>14</sup>

In addition to its ability to land safely in confined areas and on decks, STOVL aircraft are able to land easier and safer at night and in poor weather since they do not require conventional arresting-gear systems.<sup>15</sup>

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<sup>11</sup> Tomassetti.

<sup>12</sup> Tomassetti.

<sup>13</sup> Brown.

<sup>14</sup> Shorter.

<sup>15</sup> Brown.

The estimated flyaway costs of the CV and STOVL variants of the JSF are nearly identical; however, the operating cost difference between the two is significant. Since 1990, ship designers have been conducting several studies in carrier design and cost. The results of these studies show that the most important factor in determining the life-cycle cost of the ship is the number of personnel required to operate the ship, not the size of the ship.<sup>16</sup> As a result, CV versions of the JSF will have higher operating costs because they need to operate from carriers, which will always require more personnel to operate and maintain arresting gear and catapults than a similar sized amphibious ship that does not possess launching and arresting equipment.<sup>17</sup> Buying all STOVL versions of the JSF for the USMC would save both the USN and USMC money in the future by eliminating extra personnel, reducing the number of aircraft using the catapults and arresting gear, and prolonging the maintenance life of these expensive launching and recovery systems.

#### SEA BASING

In addition to STOVL's flexibility and cost advantages, the aircraft possesses the ability to support Sea Basing, the future of Marine Corps and Navy strategy.

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<sup>16</sup> Sweetman, 50.

<sup>17</sup> Sweetman, 52.

"Sea Basing generally is thought about in terms of logistics or as a managed provision of sustainment to units ashore from ships offshore...Although sustainment may be an overriding aspect of how Sea Basing is perceived, Chief of Naval Operations (CNO) Admiral Vern Clark describes it instead as 'a foundation from which offensive and defensive fires are projected-making Sea Strike and Sea Shield realities.'"<sup>18</sup>

The Expeditionary Strike Group (ESG) will be responsible for carrying out Sea Strike missions that do not require the increased firepower necessary for high threat Sea Shield missions.<sup>19</sup> The only fixed-wing aircraft in the ESG is the Harrier. To fulfill this fixed-wing CAS in the future, STOVL aircraft are mandatory. Without this fixed-wing capability inherent to the Marine Air Ground Task Force, MAGTF commander abilities to project fires would be diminished. Purchasing the CV JSF would require conventional carriers and hinder the future development of amphibious and logistical ships, which will support STOVL operations.<sup>20</sup>

#### CONCLUSION

The USMC's decision whether to purchase a mixture of CV and STOVL JSFs or just the STOVL variant will affect fixed-wing aviation's ability to support MAGTF commanders. The STOVL JSF provides greater basing flexibility, long term cost savings, and the future ability to support Sea Basing. If the Marine Corps

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<sup>18</sup> Shorter.

<sup>19</sup> Shorter.

<sup>20</sup> Shorter.



does not fully commit to the STOVL JSF, the future of Marine Corps CAS will be compromised.

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