

Denying VEOs safe haven through hub and spoke aerial sustainment

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13. SUPPLEMENTARY NOTES A paper submitted to the faculty of the NWC in partial satisfaction of the requirements of the curriculum. The contents of this paper reflect my own personal views and are not necessarily endorsed by the NWC or the Department of the Navy.					
14. ABSTRACT United States Africa Command (AFRICOM) has struggled with air support for the entirety of its 10-year existence. To meet the demands of the theatre, AFRICOM has adapted to use both military and civilian aircraft to meet its missions. Violent Extremist Organizations (VEO)s in Africa thrive in the vast ungoverned spaces on the continent and efforts by AFRICOM to deny these ungoverned spaces to VEOs have challenged AFRICOM's aerial sustainment efforts. By developing a persistent hub and spoke system, AFRICOM would be able to leverage a wider range of assets, to include Non-Standard Aviation platforms, and more reliably shrink the ungoverned regions that harbor VEOs.					
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U.S. Student

United States Africa Command (AFRICOM) has struggled with air support for the entirety of its 10-year existence.¹ Plagued by a lack of resources, AFRICOM has historically relied on temporary solutions to meet the demands of the theater and optimized its organization to support them.²³ These solutions have ranged from ad hoc task forces composed of diverse airframes from varied mission sets, to crisis response elements drawn from the nation's reserve.⁴ To augment its military air assets, AFRICOM frequently relies on contracted platforms to guarantee mobility and casualty evacuation (CASEVAC) for ground forces, particularly when the demand from other theaters reduces AFRICOM's allocation to dangerously low levels.⁵ This situation has forced AFRICOM into a pattern of establishing access from the air, sustaining operations on an as needed basis, and then divesting of that access to repurpose their finite resources against a more pressing assignment.⁶

Violent Extremist Organizations (VEO)s have adapted to this pattern and its associated lack of permanence on the continent by finding safe havens that challenge AFRICOM to reach

¹ Krulick, J. N., USAF (2013). "Airlift in Africa: Building operational logistics capability for the African standby force," *Army Sustainment*, 45, no. 1, (2013):10-18, accessed 30 August 2018, ProQuest.

² Matton, J. (2014). *Africa as a laboratory for the US light-footprint strategy: How the US preserves its interests in Africa today* (Order No. 10305853), 20. Available from ProQuest Central; ProQuest Dissertations & Theses Global. (1862209967). Retrieved from <https://search-proquest-com.usnwc.idm.oclc.org/docview/1862209967?accountid=322>

³ Imbro, Vincent E., Maj. (2015). *Non-Standard Fixed Wing Aviation: The Recipe for Addressing Specialized Mobility Shortfalls* (Accession No. AD1040706): 9. Available from Defense Technical Information Center. Retrieved from <http://www.dtic.mil/dtic/tr/fulltext/u2/1040706.pdf>.

⁴ Demmers, Jolle and Lauren Gould, "An assemblage approach to liquid warfare: AFRICOM and the 'hunt' for Joseph Kony," *Security Dialogue*, 49, no. 5, (2018): 364-381, accessed 8 October 2018, Sage Journals.

⁵ Imbro, Vincent E., Maj. (2015). *Non-Standard Fixed Wing Aviation: The Recipe for Addressing Specialized Mobility Shortfalls* (Accession No. AD1040706): 2-3. Available from Defense Technical Information Center. Retrieved from <http://www.dtic.mil/dtic/tr/fulltext/u2/1040706.pdf>.

⁶ Demmers, Jolle and Lauren Gould, "An assemblage approach to liquid warfare: AFRICOM and the 'hunt' for Joseph Kony," *Security Dialogue*, 49, no. 5, (2018): 364-381, accessed 8 October 2018, Sage Journals.

U.S. Student

them by air.⁷ A second order effect is that American diplomatic and humanitarian organizations are denied access to the regions in which VEOs thrive; these regions are often the most remote and war-torn areas of the continent most in need of American support.⁸⁹ Therefore, as long as there are remote ungoverned regions outside of friendly air capability, VEOs will continue to undermine the stability of states in the AFRICOM area of responsibility.¹⁰

Unfortunately, AFRICOM's current solutions to reach VEO safe havens do not meet the demands of the theater and are limited by expansive geography, poor tasking, and primitive infrastructure.¹¹ To reliably reach the remote and ungoverned regions of the continent that harbor VEOs, AFRICOM must continue to forward base its forces as close to the enemy as possible, while also sustaining its forward presence with a persistent hub and spoke network resourced by aircraft that can reliably interconnect the remote expanses of the continent. A hub and spoke network would overcome Africa's poor infrastructure, improve tasking efficiency for air planners, and compensate for AFRICOM's perennial resource constraints by capitalizing on a simple system that a wide range of airframes can support.

AFRICOM's current method of reaching the remote parts of Africa that harbor VEOs by air is to forward base its Intelligence, Surveillance and Reconnaissance (ISR), assault and strike

⁷ McCaskey, Kevin K., "Airpower and the Expeditionary Trinity: Emerging Threats, Emerging Locations, and Emerging Capabilities," *Air & space power journal* 31, no. 4 (December 2017): 52.

⁸ Spaven, Paul F. Maj., "A US Air Force Strategy for Africa," *Air University Maxwell AFB AL Air Force Research Institute*, Drew Paper, no. 7, (2009): 67-68.

⁹ Rice, Susan E., "The National Security Implications of Global Poverty" (speech, the University of Michigan Law School, University of Michigan, Ann Arbor, MI, January 30, 2006). Available from Brookings Institution. Retrieved from <https://www.brookings.edu/wp-content/uploads/2016/06/20060130-1.pdf>.

¹⁰ Waldhauser, Thomas D. Gen. USMC, "Testimony," Senate, *Statement of General Thomas D. Waldhauser, United States Marine Corps Commander United States Africa Command before the Senate Committee on Armed Services*, 115th Cong., 2nd sess., 2018, 6.

¹¹ Demmers, Jolle and Lauren Gould, "An assemblage approach to liquid warfare: AFRICOM and the 'hunt' for Joseph Kony," *Security Dialogue*, 49, no. 5, (2018): 364-381, accessed 8 October 2018, Sage Journals.

U.S. Student

aircraft as close to VEO safe havens as possible.¹² The purpose is threefold: first, it reduces the practical effect of having to fly extreme distances to reach the target area which increases loiter ability; second, it mitigates the lack of aerial refueling support available in AFRICOM writ large, and third, it allows a wider range of aircraft to be tasked to support the mission because the range requirements are as low as possible.¹³ Because the American presence in Africa has historically been small, AFRICOM relies on two strategies to achieve its intended reach: collocating assets on established foreign bases such as Army manned ISR platforms on the French base in N'Djamena, Chad, and building new bases in key locations like the Air Force Unmanned Aerial System facility in Agadez, Niger.¹⁴¹⁵ While these strategies are effective at addressing short term hotspots and certainly reduce transit distances for a wide range of ISR, assault and strike platforms, they challenge aerial sustainment due to the remote locations of the bases.¹⁶

Africa, unlike most westernized parts of the globe, does not have a robust surface infrastructure and as a result air is often the only method to reliably move personnel and cargo.¹⁷ Paradoxically, despite the need for a strong air transport infrastructure, nearly every aspect of air

¹² Gaddis, Joseph D, USAF, "Rethinking the Last Tactical Mile: Adaptive Air Logistics in Africa," *Army Sustainment* 44, no. 4 (July/August 2012): 35, accessed 30 August 2018, ProQuest.

¹³ Spaven, Paul F. Maj., "A US Air Force Strategy for Africa," *Air University Maxwell AFB AL Air Force Research Institute*, Drew Paper, no. 7, (2009): 66.

¹⁴ McBride, Courtney, "AFRICOM Chief: ISR outlook improving as partner capacity grows," *Inside the Pentagon* 31, no. 47 (November 2015): 1, accessed 30 August 2018, ProQuest.

¹⁵ Waldhauser, Thomas D. Gen. USMC, "Testimony," Senate, *Statement of General Thomas D. Waldhauser, United States Marine Corps Commander United States Africa Command before the Senate Committee on Armed Services*, 115th Cong., 2nd sess., 2018, 15.

¹⁶ Pastuzyn, Michael, Maj. "The Potential for Additional Channel Airlift in a Low Cargo Demand Theater," *Air Force Institute of Technology Wright-Patterson AFB OH Graduate School of Engineering and Management* (2014): 23.

¹⁷ Greenberg, Bruce, "Reliable Air Travel a Vital Part of African Development: Corporate conference focuses on Africa's infrastructure," *State Department Documents / FIND*, (September 2006): 1, accessed 30 August 2018, ProQuest.

U.S. Student

travel in Africa is underdeveloped, expensive, and inefficient.¹⁸ This reflects the fingerprints of colonialism because air travel in Africa is only optimized to flow traffic onto, and off of the continent.¹⁹ Specifically, the African air transport system is designed to connect state subsidized airlines from their home country to Europe, the Middle East, Asia and the Americas: not to each other.²⁰ A damaging byproduct of this lack of connection between African states is that the existing air route structure actually frustrates rather than facilitates interstate travel for both civil and military aircraft.²¹ Compounding this problem is a universal lack of radar coverage outside of major airports in Africa, which, combined with limited Air Traffic Control (ATC) services, further slows and complicates air travel.²²

AFRICOM has adapted to the challenges of poor African air infrastructure by building on-demand routes that radiate from the American base at Camp Lemonier, Djibouti, or from off continent at Central Command or European Command bases.²³ These routes are generally formed after remote task force bases are established, and then evolve based on the limitations of

¹⁸ Ssamula, Bridget and Christoffel Venter, "Application of Hub-and-spoke Networks in Sparse Markets: The Case of Africa," *Journal of Transport Economics and Policy* 47, no. 2 (May 2013): 281, accessed 30 August 2018, JSTOR.

¹⁹ "Departure Delayed; Aviation in Africa." *The Economist* 418, no. 8976 (February 2016): 53-n/a. <https://search-proquest-com.usnwc.idm.oclc.org/docview/1764813646?accountid=322>.

²⁰ "Departure Delayed; Aviation in Africa." *The Economist* 418, no. 8976 (February 2016): 53-n/a. <https://search-proquest-com.usnwc.idm.oclc.org/docview/1764813646?accountid=322>.

²¹ Ssamula, Bridget and Christoffel Venter, "Application of Hub-and-spoke Networks in Sparse Markets: The Case of Africa," *Journal of Transport Economics and Policy* 47, no. 2 (May 2013): 281-282, accessed 30 August 2018, JSTOR.

²² Pastuzyn, Michael, Maj. "The Potential for Additional Channel Airlift in a Low Cargo Demand Theater," *Air Force Institute of Technology Wright-Patterson AFB OH Graduate School of Engineering and Management* (2014): 23-24.

²³ Waldhauser, Thomas D. Gen. USMC, "Testimony," Senate, *Statement of General Thomas D. Waldhauser, United States Marine Corps Commander United States Africa Command before the Senate Committee on Armed Services*, 115th Cong., 2nd sess., 2018, 12, 23.

U.S. Student

the platforms available to fly them.²⁴ Unfortunately, due to the lack of efficient routing and a shortage of suitable airports, on-demand mobility aircraft are frequently forced to fly long, circuitous routes which further frustrate AFRICOM sustainment efforts by making scheduled military air support to remote bases incredibly inefficient.²⁵ To resupply remote task forces engaged in pursuing VEOs more efficiently, and to enable commanders the flexibility to base closer to the enemy, an enduring hub and spoke network linking geographically separated forces should be established to replace the current on-demand model.²⁶

While the hub and spoke concept is not in and of itself novel, it does offer a unique advantage for air operations in Africa.²⁷ Because ungoverned regions and the VEOs that inhabit them are widely dispersed in Africa, there is an inherent advantage for friendly forces to interconnect remote task force bases to enhance sustainment and reduce the effects of geography.²⁸ If connected to hubs via flexible spoke routes, task forces would be able to shift location in response to the enemy more readily, because there would be sufficient air mobility to support their movement. Further, large amounts of personnel and cargo could be optimized at large all-weather hubs, and then distributed faster and more efficiently to smaller hubs that feed into the spoke network. The development of a military hub and spoke network in Africa would also significantly increase the daily cargo and personnel throughput to a large geographic area,

²⁴ Krulick, J. N., USAF (2013). "Airlift in Africa: Building operational logistics capability for the African standby force," *Army Sustainment*, 45, no. 1, (2013):10-18, accessed 30 August 2018, ProQuest.

²⁵ Ibid.

²⁶ McCaskey, Kevin K., "Airpower and the Expeditionary Trinity: Emerging Threats, Emerging Locations, and Emerging Capabilities," *Air & space power journal* 31, no. 4 (December 2017): 53.

²⁷ Ssamula, Bridget and Christoffel Venter, "Application of Hub-and-spoke Networks in Sparse Markets: The Case of Africa," *Journal of Transport Economics and Policy* 47, no. 2 (May 2013): 280, accessed 30 August 2018, JSTOR.

²⁸ McCaskey, Kevin K., "Airpower and the Expeditionary Trinity: Emerging Threats, Emerging Locations, and Emerging Capabilities," *Air & space power journal* 31, no. 4 (December 2017): 52.

U.S. Student

which would enable infinite resupply endpoints. The hub and spoke system therefore could help constrain, and ultimately eliminate ungoverned territory friendly to VEOs by supporting the remote bases engaged in ISR, assault and strike with aerial sustainment.

To implement an effective hub and spoke system in AFRICOM, air planners must build a scalable network.²⁹ Specifically, hubs must be located at strategic locations within range of one another so that they are efficient and expandable, but not so close that the advantage of the system is lost.³⁰ An obvious starting point for designing this type of network would be to divide the continent into regions and designate centralized hubs within each region that can facilitate deep access through their spoke routes.³¹ Unfortunately, symmetrically subdividing Africa in order to build an efficient air network neither accounts for the asymmetric disposition of African ungoverned regions and VEOs, nor the remoteness of the outposts pursuing them.³² Because the distances between some ungoverned regions far exceeds the range of all but the most robust airlift assets, a different approach is required to use a wider variety of platforms and realize the full advantage of the system.

A more pragmatic approach for the development of a military hub and spoke network would be to capitalize on AFRICOM's current air infrastructure and use the already successful existing air bases as a model for hub design. For example, AFRICOM already has an excellent

²⁹ Ibid., 53.

³⁰ Ssamula, Bridget and Christoffel Venter, "Application of Hub-and-spoke Networks in Sparse Markets: The Case of Africa," *Journal of Transport Economics and Policy* 47, no. 2 (May 2013): 283, accessed 30 August 2018, JSTOR.

³¹ Ibid., 289.

³² Waldhauser, Thomas D. Gen. USMC, "Testimony," Senate, *Statement of General Thomas D. Waldhauser, United States Marine Corps Commander United States Africa Command before the Senate Committee on Armed Services*, 115th Cong., 2nd sess., 2018, 4.

U.S. Student

anchor at the American intermodal facility at Camp Lemonnier in Djibouti.³³ From Djibouti, AFRICOM currently runs an air mobility route through N'Djamena, Chad to Ouagadougou, Burkina Faso that efficiently and effectively links the Horn of Africa to the Sahel region.³⁴ While other linear routes from Djibouti exist, N'Djamena and Ouagadougou's example provide excellent models of hubs that are strategically located, secure, and permit deep access to the most remote bases. Expanding the network then becomes a process of adding hubs when the spoke routes exceed the range of the aircraft flying them. This approach will maintain deep access, but as a byproduct would also ensure increased, predictable, and reliable cargo and passenger capacity within the system. The increased cargo capacity may appear wasteful at first glance, but aerial sustainment requirements in Africa, specifically for the interagency, have traditionally gone unfilled or unrequested because AFRICOM's capacity has historically been so low.³⁵

With increased cargo and passenger capacity, AFRICOM could more effectively enable its partner agencies as part of its broader campaign plan.³⁶ AFRICOM has placed a strong emphasis on diplomatic and humanitarian efforts as a key component of their strategy to prevent a crisis rather than respond to one.³⁷ Unfortunately, these efforts are difficult to sustain because

³³ Matton, J. (2014). *Africa as a laboratory for the US light-footprint strategy: How the US preserves its interests in Africa today* (Order No. 10305853), 19. Available from ProQuest Central; ProQuest Dissertations & Theses Global. (1862209967). Retrieved from <https://search-proquest-com.usnwc.idm.oclc.org/docview/1862209967?accountid=322>

³⁴ Waldhauser, Thomas D. Gen. USMC, "Testimony," Senate, *Statement of General Thomas D. Waldhauser, United States Marine Corps Commander United States Africa Command before the Senate Committee on Armed Services*, 115th Cong., 2nd sess., 2018, 16.

³⁵ Miles, William F. S., "Deploying Development to Counter Terrorism: Post-9/11 Transformation of U.S. Foreign Aid to Africa," *African Studies Review* 55, no. 3 (December 2012): 48, accessed 30 August 2018, ProQuest.

³⁶ Waldhauser, Thomas D. Gen. USMC, "Testimony," Senate, *Statement of General Thomas D. Waldhauser, United States Marine Corps Commander United States Africa Command before the Senate Committee on Armed Services*, 115th Cong., 2nd sess., 2018, 2.

³⁷ Ibid.

U.S. Student

the agencies tasked to accomplish these projects are reliant on the existing, inefficient African commercial air infrastructure or expensive contracted air support. As a result, diplomatic and humanitarian agencies are often forced to invest in lower priority areas that they can reliably access, or at a minimum afford to access, rather than higher priority areas that have a greater need but are harder to sustain.³⁸ With a military hub and spoke network, AFRICOM would have the ability to gain and maintain access to the most remote portions of Africa with the greatest need. Moreover, because the spoke routes of the hub and spoke system are on-demand, the comparative cost to AFRICOM to provide this support would be minimal. Therefore, by providing under resourced diplomatic and humanitarian partners with mobility, AFRICOM has the opportunity to improve the conditions in ungoverned spaces VEO's require to survive in a permanent rather than temporary basis.³⁹

Because AFRICOM's air support is generally tasked and organized to meet specific and often temporary objectives, air planners have usually only provided it temporary air sustainment that could be easily dissolved upon mission completion.⁴⁰ Take for example the pursuit of the Lord's Resistance Army in Uganda. This operation necessitated the standing up a base of operations in Entebbe, Uganda for an aerial task force, as well as an air bridge out of Djibouti to sustain it, but both aspects were later dissolved by AFRICOM due to shifting priorities.⁴¹ While closing operational bases and dissolving unused routes makes sense, losing access to a successful former base by closing the sustainment line completely can be detrimental to future operations,

³⁸ Spaven, Paul F. Maj., "A US Air Force Strategy for Africa," *Air University Maxwell AFB AL Air Force Research Institute*, Drew Paper, no. 7, (2009): 67-68.

³⁹ Demmers, Jolle and Lauren Gould, "An assemblage approach to liquid warfare: AFRICOM and the 'hunt' for Joseph Kony," *Security Dialogue*, 49, no. 5, (2018): 364-381, accessed 8 October 2018, Sage Journals.

⁴⁰ Ibid.

⁴¹ Ibid.

U.S. Student

particularly in austere locations with already limited support.⁴² With a hub and spoke system, AFRICOM could maintain a longer term, albeit limited, presence in the area by using a cold base as a potential future hub. By keeping financial ties warm through aviation fuel sales, AFRICOM could both normalize an American presence in the area and preserve perishable aircrew knowledge of the region by continuing to transit crews. In doing so, AFRICOM would be rewarded with a greatly shortened amount of time a future task force would need to start, or restart, operations in the region.

Organizationally, operationalizing and expanding a hub and spoke system in Africa is still challenged by AFRICOM's historical lack of resources.⁴³ Presently, AFRICOM receives limited air support from the US military.⁴⁴ At times that support can range from large United States Air Force (USAF) transports to niche United States Marine Corps tiltrotors.⁴⁵ Because military support is unpredictable, predominantly because AFRICOM ranks lower on DOD allocation plans than other COCOMs, AFRICOM is often forced to task assets that are mismatched to their requirement.⁴⁶ For example, helicopters are often forced to operate at or near their performance limit to resupply remote Special Operations Force (SOF) teams because there are either no fixed wing aircraft available, or the amount of cargo is less than a competing requirement that would require a plane's full cargo capacity. With an enduring hub and spoke

⁴² Ibid.

⁴³ Krulick, J. N., USAF (2013). "Airlift in Africa: Building operational logistics capability for the African standby force," *Army Sustainment*, 45, no. 1, (2013):10-18, accessed 30 August 2018, ProQuest.

⁴⁴ Matton, J. (2014). *Africa as a laboratory for the US light-footprint strategy: How the US preserves its interests in Africa today* (Order No. 10305853). Available from ProQuest Central; ProQuest Dissertations & Theses Global. (1862209967). Retrieved from <https://search-proquest-com.usnwc.idm.oclc.org/docview/1862209967?accountid=322>.

⁴⁵ Ibid.

⁴⁶ Spaven, Paul F. Maj., "A US Air Force Strategy for Africa," *Air University Maxwell AFB AL Air Force Research Institute*, Drew Paper, no. 7, (2009): 71.

U.S. Student

network, assets could be tasked to support the network rather than tasked to support each individual requirement. Furthermore, the network could employ a wider range of assets based on broad objective capabilities like the runway size required, payload capacity, and overall range which would also greatly simplify optimizing which platforms fly which legs in the network.⁴⁷ Through optimization, fast long-range platforms could fly between hubs while short-range light platforms could fly low demand spoke routes. This approach would further increase overall capacity of the network by eliminating platform to mission mismatch.⁴⁸

To fly the established hub and spoke network successfully, AFRICOM will require a fleet of flexible and tailored platforms that can operate across a multitude of mission sets.⁴⁹ Over the last decade, AFRICOM has capitalized on whatever platform is available without settling on any definitive requirements for the theater.⁵⁰ Though not a requirement, AFRICOM has historically favored smaller, low visibility aircraft in lieu of large airlift aircraft.⁵¹ This is because large airlift platforms, though capable, come with large personnel and equipment footprints while small low visibility assets have light footprints that reduce the signature of American forces on a continent where colonial sensitivities remain strong.⁵² Additionally, smaller platforms simply

⁴⁷ McCaskey, Kevin K., "Airpower and the Expeditionary Trinity: Emerging Threats, Emerging Locations, and Emerging Capabilities," *Air & space power journal* 31, no. 4 (December 2017): 52.

⁴⁸ Spaven, Paul F. Maj., "A US Air Force Strategy for Africa," *Air University Maxwell AFB AL Air Force Research Institute*, Drew Paper, no. 7, (2009): 71.

⁴⁹ Ibid.

⁵⁰ Imbro, Vincent E., Maj. (2015). *Non-Standard Fixed Wing Aviation: The Recipe for Addressing Specialized Mobility Shortfalls* (Accession No. AD1040706): 2. Available from Defense Technical Information Center. Retrieved from <http://www.dtic.mil/dtic/tr/fulltext/u2/1040706.pdf>.

⁵¹ Ibid.

⁵² Matton, J. (2014). *Africa as a laboratory for the US light-footprint strategy: How the US preserves its interests in Africa today* (Order No. 10305853), 20. Available from ProQuest Central; ProQuest Dissertations & Theses Global. (1862209967). Retrieved from <https://search-proquest-com.usnwc.idm.oclc.org/docview/1862209967?accountid=322>

U.S. Student

require less support and can operate on a wider range airfields.⁵³ As of 2011, only 207 African airports could support even a C130, which is the smallest traditional USAF airlift platform.⁵⁴ Thus smaller, low visibility platforms are advantageous because they critically retain the ability to access austere or unsurveyed airfields that are usually off limits to traditional airlift platforms.⁵⁵ Critically, because there is almost no threat to air in Africa, there is an opportunity to match unprotected, smaller, low visibility aircraft to AFRICOM requirements without having to compete with other combatant commands for the resource.⁵⁶

For the last ten years the USAF has experimented with low visibility Non-Standard Aviation (NSAv) platforms that provide off the shelf mobility outside the declared theaters of armed conflict.⁵⁷ In AFRICOM, these platforms started as light, single engine, fixed wing turboprop aircraft that could land on dirt roads and evolved into medium, twin engine, fixed wing turboprops that now required larger hard surfaced airports.⁵⁸ Because only 15% of African airports have the capacity for even medium fixed wing aircraft, the light platforms were essential to resupplying remote bases operating in close range of VEOs.⁵⁹ Unfortunately, due to the demand for ISR in other theaters, the light fixed wing NSAv program was dissolved and the

⁵³ John A. Shaud, *In Service to the Nation: Air Force Research Institute Strategic Concept for 2018-2023* (Alabama: Air University Press, 2011).

⁵⁴ Imbro, Vincent E., Maj. (2015). *Non-Standard Fixed Wing Aviation: The Recipe for Addressing Specialized Mobility Shortfalls* (Accession No. AD1040706); 2. Available from Defense Technical Information Center. Retrieved from <http://www.dtic.mil/dtic/tr/fulltext/u2/1040706.pdf>.

⁵⁵ Ibid.

⁵⁶ Ibid.

⁵⁷ Ibid.

⁵⁸ Ibid.

⁵⁹ John A. Shaud, *In Service to the Nation: Air Force Research Institute Strategic Concept for 2018-2023* (Alabama: Air University Press, 2011).

U.S. Student

existing airframes were converted into ISR platforms.⁶⁰ Medium NSAs continue to support AFRICOM's forward bases but are no longer able to service the bases closest to the most austere VEO safe havens due to lack of suitable airfields.⁶¹ Compounding the issue has been a rebalancing of priorities within the USAF as well as persistent budget uncertainty which has resulted in the USAF maintaining only 17 medium NSAv airframes.⁶² This has left commanders in regions such as AFRICOM unable to reliably sustain their outposts operating in VEO safe havens.⁶³

AFRICOM reacted to the reduction in NSAv support by contracting light civilian mobility platforms that bridged the most critical gaps left primarily by the light NSAv retirement; most notably Personnel Recovery (PR) and CASEVAC at austere forward bases.⁶⁴ Though the mobility gap left by the light NSAv remains, the contracted platforms have proven effective and could continue to augment AFRICOM by 'plugging in' to the hub and spoke system where their capability is most needed.⁶⁵ For a persistent hub and spoke network to interconnect the continent enough to truly eliminate VEO safe havens though, AFRICOM must continue to resource its network in this military and contract hybrid manner.⁶⁶ It is unreasonable

⁶⁰ Imbro, Vincent E., Maj. (2015). *Non-Standard Fixed Wing Aviation: The Recipe for Addressing Specialized Mobility Shortfalls* (Accession No. AD1040706): 11. Available from Defense Technical Information Center. Retrieved from <http://www.dtic.mil/dtic/tr/fulltext/u2/1040706.pdf>.

⁶¹ Gaddis, Joseph D, USAF, "Rethinking the Last Tactical Mile: Adaptive Air Logistics in Africa," *Army Sustainment* 44, no. 4 (July/August 2012): 41, accessed 30 August 2018, ProQuest.

⁶² Imbro, Vincent E., Maj. (2015). *Non-Standard Fixed Wing Aviation: The Recipe for Addressing Specialized Mobility Shortfalls* (Accession No. AD1040706): 2. Available from Defense Technical Information Center. Retrieved from <http://www.dtic.mil/dtic/tr/fulltext/u2/1040706.pdf>.

⁶³ Ibid.

⁶⁴ Ibid.

⁶⁵ Ibid.

⁶⁶ Ibid.

U.S. Student

to expect finite military mobility assets to be permanently assigned to AFRICOM given significant demand elsewhere, but by building a hub and spoke network that takes full advantage of NSAv platforms and continues to leverage contract platforms to bridge light NSAv requirements, the effect of short resourcing can be minimized enough to meet the demands of the theatre. Critically, the inefficiency of the current on-demand system will be reduced, while the ability of task forces to base in the most remote ungoverned regions will be much more feasible. Additionally, military heavy airlift could then be leveraged to sustain the hubs only, rather than individually support geographically dispersed task forces. This will ultimately reduce the burden on USAF strategic airlift and provide scalability as both cargo and CASEVAC/PR demands shift. Moreover, it will enable persistent and rapid humanitarian and non-combatant evacuation operations capability within the smaller decentralized hubs that underpin the hub and spoke system.⁶⁷ Finally, having a semi-dedicated fleet of like platforms operating out of established hubs will also build a knowledge base for aircrews that could be applied in crisis situations without having to relearn the nuances of the continent as in years past.

Though AFRICOM has persistently struggled with air support, there is an opportunity to improve its reach by no longer sustaining forces in remote regions using the current model.⁶⁸ AFRICOM's aerial sustainment solutions do not meet the demands of the theater and will remain hampered due to poor tasking, extreme distances, and primitive infrastructure.⁶⁹ For

⁶⁷ Spaven, Paul F. Maj., "A US Air Force Strategy for Africa," *Air University Maxwell AFB AL Air Force Research Institute*, Drew Paper, no. 7, (2009): 52.

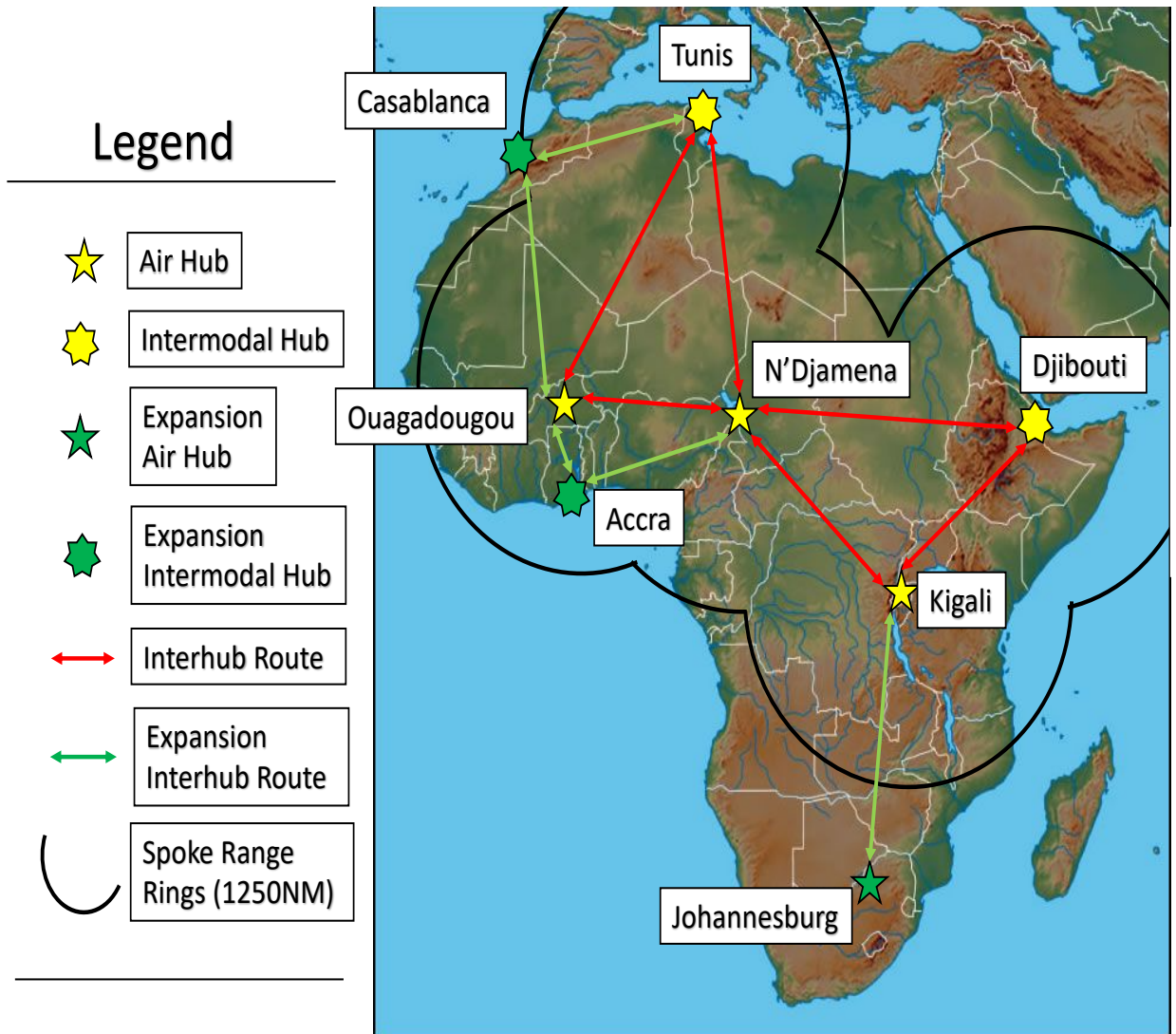
⁶⁸ Krulick, J. N., USAF (2013). "Airlift in Africa: Building operational logistics capability for the African standby force," *Army Sustainment*, 45, no. 1, (2013):10-18, accessed 30 August 2018, ProQuest.

⁶⁹ Demmers, Jolle and Lauren Gould, "An assemblage approach to liquid warfare: AFRICOM and the 'hunt' for Joseph Kony," *Security Dialogue*, 49, no. 5, (2018): 364-381, accessed 8 October 2018, Sage Journals.

U.S. Student

AFRICOM's ground and air assets to reach the remote and ungoverned regions harboring VEOs, AFRICOM must enhance its ability to sustain forces with a hub and spoke network that can be resourced by either military or contract platforms, tasked against their capabilities within the system rather than devise a system around their capabilities. Though AFRICOM will likely continue to be plagued by a lack of resources, adopting a flexible, simple, and enduring approach to aerial sustainment will allow AFRICOM to integrate a wider variety of capabilities, and move a larger amount of personnel and cargo to far more remote locations.

Figure 1



Proposed hub and spoke structure with primary and expansion hubs identified.

Intermodal facilities anchor the system at strategic endpoints. The system requires a distance between hubs of no more than 1500NM and spoke lengths no longer than 1250NM to use the preponderance of airframes currently available.⁷⁰

Figure 2

⁷⁰ King, Angela, *Africa Physical Map*, 2006, Geology.com, accessed 8 October 2018, <https://geology.com/world/africa-physical-map.shtml>.



USAF Light NSA v based on the Pilatus PC-12 airframe; later converted to U-28 ISR airframes⁷¹

Figure 3

⁷¹ US Air Force Photo, *U28 Takeoff*, July 2012, Defense Media Network, accessed 8 October 2018, https://i0.wp.com/www.defensemedianetwork.com/wp-content/uploads/2012/07/PC-12_takeoff.jpg.

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Current USAF Medium NSAv airframe: C146A Wolfhound / Dornier 328; 17 exist globally.⁷²

⁷² US DoD Photo, *C146A Wolfhound*, accessed 8 October 2018, <http://www.americanspecialops.com/usaf-special-operations/intra-theater-aircraft/>.