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# Visualizing Social Networks to Inform Tactical Engagement Strategies that will Influence the Human Domain

By Molly MacCalman, Alexander MacCalman and Greg Wilson Journal Article | Aug 15 2013 - 7:17am

Visualizing Social Networks to Inform Tactical Engagement Strategies that will Influence the Human Domain

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#### **Abstract**

The Special Operations Command, Marine Corps, and Army recently formed the Strategic Landpower Task Force to study the confluence of the land, cyber, and human domains. To support the Task Force's research, this paper demonstrates the utility of visualizing social networks in order to inform a unit's population tactical engagement strategy. We illustrate how collecting, structuring and visualizing socio-cultural data can assist units to rapidly communicate human dynamics, visualize community and group affiliations, prepare for key leader engagements, highlight potential powerbrokers, and identify information gaps about the human terrain. We provide real world examples from a recent deployment to Kandahar, Afghanistan. These examples reveal how social network and link analysis can assist units to understand and influence the human domain at the tactical level.

The human domain is one of the most critical and challenging aspects of modern conflicts and will remain a decisive factor in future conflicts. A recent white paper signed by key military leadership states, "Time and again, the U.S. has undertaken to engage in conflicts without fully considering the physical, cultural and social environments that comprise what some have called the human domain."[i] In order to prevent, shape, and win future conflicts our forces must embrace the challenge of understanding and influencing the human domain. To address this challenge, a new partnership between the Special Operations Command, Marine Corps, and Army has recently chartered the Strategic Landpower Task Force to study the confluence of the land, cyber, and human domains.[ii] To support the Task Force's research, this paper illustrates the benefits of collecting, structuring and visualizing socio-cultural data to better understand and influence the human domain.

Although the methods of social network and link analysis are not new to the military's analytical community, the challenge of collecting the right data in the right structure makes these methods difficult to apply at the tactical level. To address this challenge, the Defense Analysis Department's Common Operational Research Environment (CORE) laboratory at the Naval Postgraduate School developed *Lighthouse* to help the warfighter perform geospatial, temporal, and relational analysis of social networks. [iii] *Lighthouse* facilitates the structured collection of socio-cultural data using

custom data entry forms configured for a variety of data entry platforms like mobile phones, tablets and standard computers. These platforms enable our forces to collect and push data into different software packages to analyze the human domain. To demonstrate the utility of *Lighthouse* while conducting Village Stability Operations (VSO), the first and second authors deployed to Kandahar, Afghanistan in early 2013 to train, advise, and assist units within the Special Operations Task Force – South (SOTF-S) to collect, manage, and visualize socio-cultural data. This paper provides examples of how social network and link analysis assisted units in their efforts to understand and influence the human domain at the tactical level.

#### Visualizing the Human Domain Using Models

The physical, cultural and social environments that encompass the human domain involve complicated dynamics among people and organizations. Understanding the human dynamics of the regions where our forces are deployed is essential to preventing and containing future conflict. Some examples of these dynamics include the disequilibrium of power, social inequities between ethnic or tribal groups, intimidation by insurgents, government corruption, and lack of essential services and wealth generation mechanisms. Influencing these human dynamics requires a comprehensive effort to increase our understanding of the population's key influencers and social structure.

To conceptualize the human domain we can leverage models of human networks that illuminate the interconnected sociocultural structure of government officials, local nationals, insurgents, other hostile elements, Coalition Forces, and other state and non-state actors. Humans use models to help understand the complexities of a system especially when there is a lack of information. When units operate in new areas or replace other units during transition periods, there are a lot of uncertainties about the key influential players and local human dynamics. A sociogram is a useful visual model that can help display the human dynamics within a community. These models can assist tactical units in crafting their population engagement strategies to influence the human domain.

Sociograms are diagrams that depict the social community structure as a network with social ties between nodes (see Figure 1 below). Each node represents an individual actor or other entity such as a village, tribe, or group affiliation.

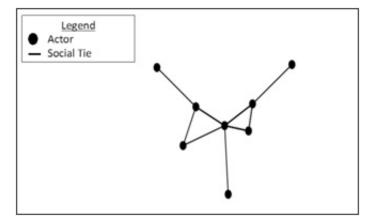


Figure 1. Sample sociogram highlighting actors as nodes and social ties as lines between nodes

Social network analysis software creates sociograms using visualization algorithms that position actors into a meaningful *social space*. Nodes are positioned so that the closer they are to one another the more social ties (or similar patterns of ties) they have in common. For example, actors from the same village and tribe are positioned closer together than actors from the same village but different tribes. Unlike link diagrams, which link actors to any number of objects, sociograms cluster groups of actors who share common social ties or group affiliations. The group clusters may be based on common affiliations to a tribe, village, political party or by the nature of their relational structure or shared social ties such as family, grievance or associate ties.

Analyzing the social structure of a human network has tremendous potential for informing tactical engagement strategies that will influence the human domain. However, in order to visualize the human networks, we must collect the right data in a structured format. The unit must collect two types of data: (1) relational data (such as family and business relationships or grievances) that represents the social ties between actors and entities and (2) attribute data that captures important actor characteristics (tribe affiliations, job title, address, or village). Traditionally, units record actor attribute data in PowerPoint slides, Excel files, and Word documents as personality "baseball cards." Critical information about the human terrain gets hidden among dozens of separate files, which replacing units must sift through to familiarize themselves with the key local influencers. Capturing the relational data of social ties between actors is rarely done because the data is difficult to collect, record, and visualize. Additionally, most of us are conditioned to focus our attention on individual characteristics or attributes like height, weight, hair color, etc. while missing key indicators of social relations between actors like which actors provide advice at a meeting or which actors share group, family or business relations. In Afghanistan, we observed several units manually creating PowerPoint slides with pictures of actors and lines between them representing social relations. These products are time consuming to produce and more importantly, do not leverage social network visualization algorithms that create a meaningful social space as described earlier. There are a number of open source, off-the-shelf social network software products that can rapidly create sociograms; some of these products include ORA, Pajek, and Gephi, [iv] Analyst notebook and Palantir are other software solutions that primarily focus on link analysis with limited social network analysis capabilities.[v]

### Fielding Lighthouse Support to Village Stability Operations

In early 2013, the CORE Lab deployed a military and civilian analyst to Afghanistan to support the SOTF-S with *Lighthouse*. The military analyst visited four military bases in the Shah Wali Kot, Arghandab, and Panjwai Districts of Kandahar Province and the civilian analyst managed and analyzed the actor data from the provincial, district, and village level while stationed at the SOTF-S headquarters. The next sections illustrate how collecting, structuring and visualizing socio-cultural data assisted units to rapidly communicate the human dynamics, visualize communities and group affiliations to identify linkages, prepare for key leader engagements, and identify potential powerbrokers.

#### **Rapid Communication of Human Dynamics**

Sociograms can display a unit's current knowledge of the human dynamics within a local village. As new information is added, the sociogram matures into a more relevant model of the human terrain. Figure 2 below shows a sociogram of local villagers, local police, government officials, and insurgents from a village within the Shah Wali Kot District. The social ties depicted in this sociogram are a combination of associate ties (an acquaintance or someone with whom you have regular social or professional contact), grievance (contentious relationship), family ties (relatives by blood or marriage), and trust ties (a strong tie between actors developed through tribal affiliation, business, or other strong affiliation). The picture itself provides minimal insights for the casual observer but for the unit that interacts with these locals on a daily basis, it serves as a model of the human dynamics. It also serves as an excellent resource when a unit's replacement arrives. The outgoing personnel can rapidly convey the human dynamics utilizing the photos, relational and attribute data shown in the sociogram. Including photographs taken with mobile devices in the sociogram serves as a visual reminder of who these actors are and where they lie in the social space.

In Figure 2, the rivalry (grievance tie) between the Afghan Local Police (ALP) commander and the regional Afghan Uniform Police (AUP) commander is indicated with a red line. Although the AUP commander officially held the position of authority in northern Shah Wali Kot, a district government official had empowered the local ALP commander as the powerbroker for the area. In addition, the unit learned that government officials were funneling money through the ALP commander's father to pay the ALP. The power struggle between the AUP commander and the ALP commander was a challenge for Coalition Forces as they worked to legitimize the AUP and enable the ALP to increase local security.

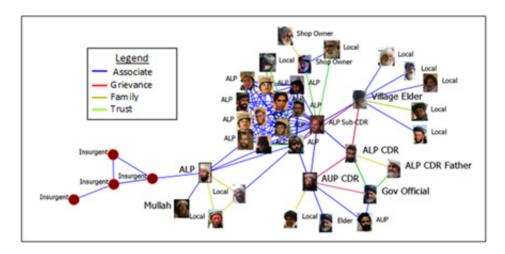


Figure 2. Shah Wali Kot District Village Sociogram

Relationships between the insurgents and local villagers are not uncommon. These relationships do not necessarily imply that a local cooperates with or supports the insurgents, but knowing where these ties exist is important. Often we suspect that a local villager is affiliated with the insurgents but do not have enough information to know for sure. By including insurgents within the sociogram in Figure 2, we can use the sociogram to help decide how to engage other actors to confirm or deny the suspected affiliation. In Figure 2 we can see an ALP member that is drawn away from the larger cluster of ALP members because he has an association tie with an insurgent actor. Although the unit did not have access to the ALP member, they could look at this sociogram to identify which actors to engage with in order to gain more information about the ALP member's social ties to the insurgents. The sociogram shows not only his family members but it also indicates that the ALP member is associated with a Mullah. Gaining a better understanding of who attends this Mullah's mosque could lead to new sources that provide further information about the ALP member and others with ties to the insurgents.

Identifying which local villagers are linked to the insurgents also provides an opportunity to understand how the insurgents are recruiting local villagers so that the unit can marginalize the insurgent's influence. Sociograms can highlight insurgent supporters within a network and indicate whether they are positioned within the network's central core or on the periphery. Insurgent actors with ties to highly connected actors (ones with a lot of ties) may be the ones that recruit sympathizers to the insurgents cause. Influencing these social ties can have a significant impact on the insurgent's points of entry. Sociograms that highlight actors who support or do not support the insurgents as well as those that are unsure (fence-sitters) will assist the unit in determining their target audiences.

Figure 2 also illustrates for the unit how much they do not know about the influencers and powerbrokers in the village. No social network provides complete information. As our knowledge of the local environment increases the visualization of the network will evolve. The village elder shown in Figure 2, recently died of a heart attack. In order to find out who may become the next village elder, the unit can engage with the local villagers who shared associate ties with the deceased elder. The locals associated with the village elder were seen together every time the unit patrolled the village.

As the unit's knowledge of the human dynamics progresses, the team leadership may not need to reference the sociogram for information about the human terrain but keeping it up to date will make the information available to all members of the unit and serve as a valuable baseline for the incoming unit to build on.

#### Visualizing Communities and Preparing for Key Leader Engagements

Identifying potential communities that share common social ties can assist units to address local disputes, build consensus, and disseminate information. In Kandahar's Arghandab District, the unit's mission was to perform tactical overwatch throughout the entire district. As a result, they had frequent interaction with the district level leadership. The unit knew

prior to their arrival in Afghanistan that the District Governor (DGOV) and the District Chief of Police (DCOP) did not get along. After a few days with the unit, we developed the sociogram shown below in Figure 3.

We used an algorithm that detects community structure in networks by coloring groups with a high density of ties within groups and a low density of ties between groups.[vi] These groups can reveal "communities" within a *social space* that have common relations shared among the actors.

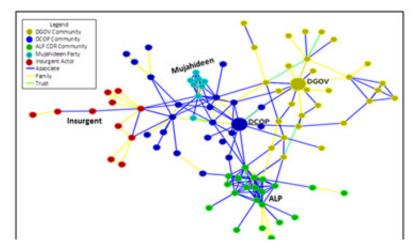


Figure 3. Arghandab District network showing five prominent communities detected within the social space

Figure 3 depicts by node color five prominent communities detected by the algorithm that center on the DGOV, DCOP, ALP commanders, Mujahedeen Party members, and the insurgent actors that operate in the northern area of the Arghandab District. The social ties depicted in this sociogram are a combination of associate, family, and trust ties. The communities identified by the algorithm are based on these social ties and do not tell us definitively which actors support each government official. However, the unit can examine the communities identified by the algorithm to confirm what they already know and find potential actors they can engage with to help resolve the tensions between the DGOV and DCOP.

The social structure in a sociogram implies an inherent flow of information or resources through the network. The unit can find actors that lie on the shortest path between pairs of actors and exploit these broker positions or bridges by manipulating the information or resources that flow through the network. Actors identified as brokers can focus the information and deception operations on specific individuals or target audiences to manage perceptions or mitigate differences between groups. In Figure 4, we hid the associate ties shown in Figure 3 and focused only on the family and trust ties to identify actors who may serve as bridges between the DGOV and the DCOP communities. We can see a chain of actors with family and trust ties that bridge the two communities. These actors may be potential candidates for the unit to engage with to help resolve or at least understand more about the rivalries between the DGOV and DCOP.

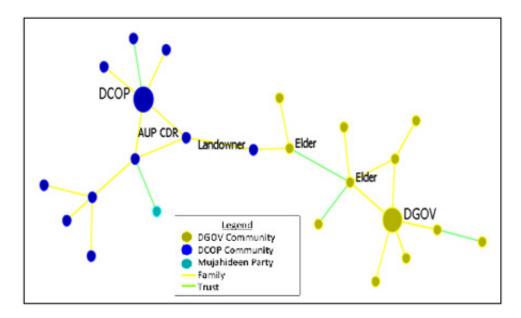


Figure 4. Actors who bridge the DGOV and DCOP communities

Sociogram can also prepare a unit for an upcoming key leader engagement (KLE). If a unit intends to influence a key actor during a KLE, knowing which actors the key actor trusts, has familial ties with, or has grievances with will provide valuable information. To prepare for a KLE shura in the Arghandab District, the unit created a sociogram of all actors they knew that were affiliated with the village. The unit printed several copies of the sociogram to serve as a human terrain map of the locals they expected to attend the shura. The purpose of the shura was to assess the village elder's interests in the ALP program. Visualizing the family, trust, associate, and grievance ties between the actors helped the unit understand each elder's agenda. In addition, the sociogram was an easy way to disseminate the information to other unit members. During the shura, the unit leader took notes that were later entered into the unit's database using the mobile devices and data entry forms. Adding the actor and relational information the unit leader collected into the database made the information instantly available to the team and to the next unit working in this district. The unit learned that several key landowners absent from the meeting needed to make the final decision concerning ALP. The next time the unit engages the locals in this village, they now have a targeted communication strategy to confirm or deny the absent landowner's level of influence and add this information to the database. Rather than randomly talking to villagers during their next visit, the unit now has a specific set of target actors to engage with directly or talk about with other locals they encounter.

#### **Visualizing Affiliations to Identify Linkages Between Groups**

Actors generally identify themselves as members of one or more solidarity groups. A solidarity group is a type of affiliation where actors share interests or purpose with common attributes. Types of solidarity groups include tribes, subtribes, clans, family, kinship, and religious affiliations. Identifying the solidarity group affiliations that exist within the population is critical to understanding the human dynamics. Capturing an actor's sentiments towards other groups will help identify points of contention and focus consensus building efforts. In addition, visualizing these affiliations can reveal actors who are in a position to serve as brokers between groups.

One of the primary solidarity groups among the Afghan population is the tribal affiliation. Our understanding of tribal dynamics and conflicts affects our ability to influence the human domain. Therefore, visualizing social ties within each tribe as well as ties that span between tribes can provide units with new insights and illustrate the tribal dynamics they observe in the village. Figure 5 shows actors from Panjwai that are clustered around their tribal affiliations with grievance and family ties shown between actors who do not share the same tribe. Although the sociogram does not account for all ties that exist between the actors and tribes, it highlights the ties the unit has identified. This information can be useful to

gain a better understanding of the tribal dynamics and to identify information gaps about the human terrain. Furthermore, knowing which actors have family ties that span between tribes may reveal opportunities to mitigate tribal differences and engage with new villages while conducting VSO.

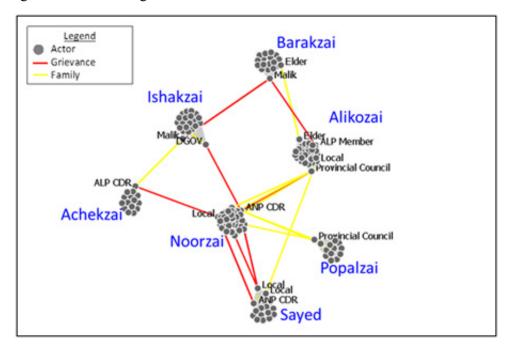


Figure 5. Known Grievance and Family Ties Between Tribes in Panjwai District

# **Identifying Powerbrokers**

Our final example demonstrates how social networks can reveal the highly influential actors or powerbrokers within a larger community. Incoming commanders and units often use a hierarchical chart of the Provincial and District officials as an introduction to the human terrain. Although these hierarchical charts are helpful, they do not convey the underlying powerbrokers that are influential within the province or district. Visualizing the key actors in a hierarchical chart within the larger context of a social network can illustrate where the key actors reside within a social space.

Figure 6 below shows the Kandahar Provincial and District level officials that are normally displayed in a hierarchical chart within a sociogram. The Kandahar Provincial and District level officials are shown as blue nodes while other local actors that have social ties with the officials are in green. We can use a variety of social network metrics that rank actors within a network by the number of ties they have, how connected they are to other highly connected actors in the network, and their ability to reach other actors across the network. [vii] In Figure 6 each actor is sized by the number of social ties he has with other actors, the more social ties the larger the actor's node. We labeled the top five actors who are not in the hierarchical chart (colored in green) but have the highest number of social ties with other actors in the network. Visualizing sociograms with nodes sized by social network metrics can help illuminate the underlying powerbrokers within the Kandahar Province that a hierarchical chart cannot.

Although the actors ranked by any social network metric are biased toward the size and composition of the network, metrics may reveal individuals the unit can engage with to influence important people or high value targets. Actors that are highly connected within the sociogram may or may not indicate whether they really are influential, but highlighting them in a sociogram will focus our attention to them in order to confirm or deny their importance.

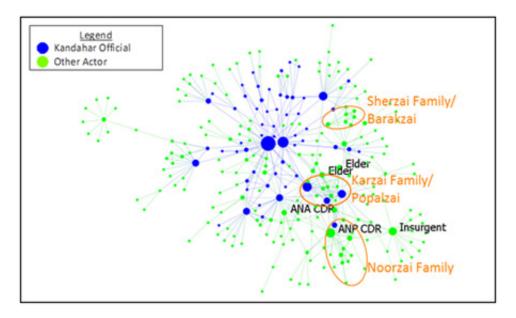


Figure 6. Powerbrokers and Influential Families within Kandahar Province

In addition, Figure 6 indicates several influential tribal families within Kandahar Province and where they lie within the broader social network. The Karzai family maintains numerous commercial interests in Kandahar province and family members influence the Popalzai tribal dynamics throughout southern Afghanistan. The Sherzai family has influential business ties within Kandahar City and family members serve as the Barakzai tribal leaders in the south. Members of the Noorzai tribal family have significant influence in both Maiwand and Panjwai Districts of Kandahar province. Visualizing this social network allows the incoming commanders and units to better understand the tribal dynamics, family ties, and grievances between influential actors within the entire province or a specific district.

#### Conclusion

Based on our experience during the deployment, we have found that collecting and structuring relational and attribute data on key actors in order to visualize them with sociograms has the following benefits:

- 1. **Rapid Communication of Human Dynamics.** Whether it is a unit's higher commander, other members of the unit, or a unit's replacement, sociograms can assists with communicating the human dynamics among the local actors. Visualizing the associate, family, trust, and grievance ties and affiliations among actors facilitates a clearer discussion about the human terrain. Including pictures as the nodes in the sociograms can rapidly reveal a level of understanding that would take months to develop.
- 2. **Identifies Information Gaps.** No model is perfect; a sociogram will never contain all the relevant actors and social connections that exist. However, the sociogram reveals what the unit does know about the human terrain and can reveal the information gaps that will help drive future collection on relevant actors. The sociograms will continually change as a unit gains more knowledge of the human terrain in order to fill their information gaps.
- 3. **Informs the Tactical Engagement Strategy.** The sociograms can help a unit make informed decisions on which actors they should interact with to gain a better understanding of the human dynamics. Units tend to gravitate towards actors that appear to be influential or hold positions of authority. These actors may try to control the people the unit interacts with. Sociograms have the potential to reveal additional target actor selection options that will help inform their tactical engagement strategy; these opportunities may not have been revealed without visualizing the social network.

Although the benefits of using social network and link analysis allow our units to better understand the complexities of the human dynamics, there is a cost. The time needed to manage and update the data can be enough of a burden for the unit to

give up on the effort. With all of the other competing demands and reporting requirements imposed on the units they are forced to prioritize their time. Therefore, because time is a precious resource, our forces need a data collection and management mechanism that is very easy to use. There is a wealth of information that resides in the heads of the soldiers on the ground interacting with the locals on a daily basis. The majority of this information is contained within written descriptions reported in daily situation reports that may or may not get entered into databases. The information is generally not in a structure that can easily be imported into analytical software packages. The purpose of *Lighthouse* is to provide our soldiers with a mechanism to capture the information they learn while deployed using custom data entry forms, configured for a variety of data entry platforms like mobile phones, tablets and standard computers that allow data to be uploaded into multiple software packages to analyze the human domain.

There is an ongoing effort to improve the military's analytical software solutions. Several of these products include Analyst Notebook, Distributed Common Ground System, and Palantir. *Lighthouse* provides a flexible government-off-the-self (GOTS) mechanism to collect, manage, and format data so that it can be imported into any analytical software product available now or in the future.

In support of the Strategic Landpower Task Force's research, this paper illustrates the benefits of collecting, structuring and visualizing socio-cultural data to better understand and influence the human domain. We demonstrate how visualizing sociograms can assist our forces with their tactical engagement strategies. Like all models, these sociograms rely on assumptions and should never completely drive operations; no model is perfect. Our biggest limitation is that we will never have a complete network with all village actors and their sentiments. We must always keep this in mind when using sociograms to inform engagement strategies. Despite these limitations, sociograms can help confirm or deny intuition, illuminate new insights, identify information gaps, scope the unit's target actor selection options, and provide a means to communicate the human dynamics, especially to the replacing units.

The Army, Marine Corps, and Special Operations Communities need a way to easily record and structure the information gained during their deployments so that it can be imported into a variety of analytical software packages and databases. Structuring data in the right way will allow our community to better perform the socio-cultural, geospatial, and temporal analysis that will enhance the commander's operational picture. Lighthouse has the potential to significantly contribute to the Strategic Landpower Task Force's charter by improving our ability to understand and influence the human domain.

We would like to thank the soldiers of 1 st Battalion, 7 th Special Forces Group (Airborne) for the opportunity to work with them while assigned to the Special Operations Task Force – South. We are honored to have served with you and are grateful for your invitation.

#### **End Notes**

[i] "Strategic Landpower: Winning the Clash of Wills," May 6, 2013, http://www.arcic.army.mil/app\_Documents/Strategic-Landpower-White-Paper-06MAY2013.pdf

[ii] Ibid.

- [iii] For further information see http://lhproject.info/about-lighthouse/
- [iv] These open-source software packages are available online. ORA: http://www.casos.cs.cmu.edu/projects/ora/software.php, Pajek: http://vlado.fmf.uni-lj.si/pub/networks/pajek/, Gephi: https://gephi.org/users/download/.
- [v] Software packages must be approved for download onto the Non-classified and Secure Internet Protocol Router (NIPR and SIPR) Networks. Units must use stand-alone computers for software that is not approved for the NIPR or SIPR Networks.
- [vi] M.E.J Newman, "Fast algorithm for detecting community structure in networks," *Physical Review E* 69, 066133

(2004).

**[vii]** For further details on social network analysis metrics see: Sean F. Everton, *Disrupting Dark Networks*. (New York: Cambridge University Press, 2012), 15.

# **Rating:**

Your rating: None

#### **About the Authors**



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Molly E. MacCalman is a Research Associate at the Naval Postgraduate School and was assigned as an analyst to the Special Operations Task Force – South in Kandahar, Afghanistan. She holds a Master's Degree in International Policy Studies from the Monterey Institute of International Studies and formerly worked in economic development consulting for USAID.



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# **Greg Wilson**

COL Greg R. Wilson graduated from the United States Military Academy and received his Master's Degree from the Naval Postgraduate School in Operations Research. He has served in variety of SOF assignments from the tactical to strategic level to include Battalion Commander, JSOTF Commander in the Southern Philippines and SOC Forward Commander in Colombia. COL Wilson currently serves as the SOCOM Chair and CORE Lab Co-Director at the Naval Postgraduate School in Monterey California.

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