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ASSOCIATION OF OLD CROWS
The CORRECT COURSE FOR *COMPASS CALL*

Summary

The need for assured electromagnetic spectrum (EMS) control in all military operations requires the ability to exploit all forms of transmission and reception that pass through it while denying the same to one's adversary. Since 1983, *Compass Call* has met that need through its small force of 14 EC-130H aircraft, jam-packed with electronic warfare (EW) equipment to disrupt enemy command and control (C2), thus limiting adversary coordination and force management. However, the combination of this now aged fleet and the advancement of adversary capabilities has rendered *Compass Call* unable to continue its mission without overhaul. As a result, the program is in the early stages of rebirth through the new Gulfstream G550 airframe. This paper summarizes the program to date, addresses strengths and weaknesses of the new platform, and recommends the future course of *Compass Call*.

Program Background

Compass Call became fully operational in 1983. Based on a heavily modified Lockheed C-130 Hercules airframe, the fleet of 14 EC-130H aircraft are fitted out with advanced EW and computer systems from BAE and integrated by L3. Over the ensuing 35 years, the EC-130H has enabled the Air Force to locate, hear, and jam enemy communications as well as block both navigation and targeting capabilities. Over the life of the program, *Compass Call* has executed close to 11,000 combat sorties and more than 66,000 flight hours[1] in many areas including Kosovo, Haiti, Panama, Libya, Iraq, Serbia and Afghanistan. Since 2002, the 41st and 43rd Electronic Combat Squadrons (ECS) have been deployed in Operation Enduring Freedom, Operation Freedom Sentinel[2], and Operation Inherent Resolve. These missions blocked military communications which left ISIS not knowing what their own forces were doing. As Lt. Col. Koslov of the 43rd Expeditionary ECS said: "If you can't talk, you can't fight."[3] Furthermore, between 2003 and 2010, *Compass Call* assets have stopped militants from using cell phones to remotely set off improvised explosive devices (IED), preventing the detonation of more than 100 bombs.[4] U.S. convoys would not move over ground without a *Compass Call* or EA-6B/EA-18G to protect from IEDs. It also appears that *Compass Call* has disrupted ISIS drones used to spy, direct artillery fire, and to drop bombs.[5]

Overall, *Compass Call* has successfully created a "fog of war" for enemy forces, disrupting enemy command and control (C2) and making it harder for them to communicate and gain situational awareness; thus, making them easier targets for U.S. and Allied forces.[6]

A Needed Overhaul

The EC-130H aircraft is in the early stages of being phased out, and the Air Force is re-hosting the *Compass Call* mission on the EC-37B, a modified Gulfstream G550 jet. The EC-130H airframe has several limitations that the new EC-37B seeks to address. However, questions remain about the proposed phase-out of the EC-130H and the delivery of the EC-37B.

Compass Call Aircraft	EC-130H	EC-37B
Speed	300 mph	528 mph
Range	2,295 miles	7,767 miles
Ceiling	25,000 ft	51,000 ft
Unit Cost	$165m	$160m
Fleet Size	14	10 planned

EC-130H

- The fleet's aged airframe has caused reliability issues resulting in high costs – both in labor and in dollars – to sustain them. Over the years, the *Compass Call* mission has expanded beyond the scope of its airframe, avionics and mission system's original design.[3] As a result, problems arise for which there is no documented solution. The result is a fleet with maintenance issues that caused the aircraft to remain on the ground when they were needed to support missions.
- The four-engine turboprop is limited to a 300 mile per hour cruising speed – in an era of 500 to 600 mph travel – which results in unnecessary delays getting to the area of conflict.
- The limited 2,300-mile range often requires either multiple stops or refueling inflight which increases time, cost, and personnel, all of which increases risk.[7] Today's aircraft can more than double that range.
- The low operational ceiling of 25,000 feet limits the EW range because the curve of the Earth obstructs line-of-sight transmission and reception (the radar horizon), rendering the EW systems impotent to support the overall mission.
- While our nation has been fighting in the Middle East for a quarter century against adversaries who lag behind in EW, others have advanced the field. The Russians have seen us lag and responded by re-engineering their entire EW fleet, as explained by Laurie Moe Buckhout, a retired Army colonel who specializes in EW. "They've ended up with killer capabilities, jamming in a multitude of frequencies for hundreds of kilometers."[8]

The issues above cannot be remedied by modifying the EC-130H. The aircraft can no longer execute its mission.

EC-37B

- The EW systems in the EC-130H aircraft will be moved to the EC-37B to support operations in anti-access/area denial (A2/AD) and irregular warfare environments.[9]
- The new fleet of *Compass Call* aircraft, the Gulfstream G550, will cost approximately the same as a new EC-130H ($160m).
- The cruising speed of 528 mph will mean getting to the conflict in nearly half the time while consuming far less fuel.
- The operating range of 7,767 miles more than triples the distance of the EC-130H, eliminating the need for multiple stops, inflight refueling, and which reduces time, cost, number of resources needed and overall risk. This increased range also provides for much greater loiter time on station to conduct operations.
- A service ceiling of 51,000 feet – twice that of the EC-130H – means safer transit and enhanced EW capability due to the greater radar horizon. This, combined with the greater speed, means greater EW services in much less time.

A Needed Overhaul (cont.)

- The EC-37B will have essentially the same EW systems installed, thus perpetuating similar EW fighting abilities. However, this far more capable aircraft provides the ability to incorporate yet-to-come more advanced systems.

Program Challenges

Even with the significant performance abilities of the new G550 airframe, several challenges remain:

- **Band IV:** Right now, the EC-37B cannot receive or transmit in Band IV of the spectrum (the ultra-high frequency portion generally defined as from 470 to as much as 614 MHz) which is commonly used for television broadcasting and mobile devices.[10] One issue is that the Band IV antenna used on the EC-130H was not designed to withstand the aerodynamic forces of flight on the EC-37B at more than 500 mph in air temperatures that can drop to -80F.[11] A second issue is that the development of a new Band IV antenna was not budgeted in the $160M price per aircraft cross deck program.
- **Delivery:** A key concern is that of the 14 EC-130H *Compass Call* aircraft, plans to retire remaining Block 1 aircraft begin in late 2018 and the first Block 2 aircraft are scheduled to retire in 2021; however, the first delivery of the EC-37B does not begin until mid-2023, leaving at least a two-year gap of aircraft available to carry-out the *Compass Call* mission. In the FY 2019 National Defense Authorization Act (NDAA), Congress recognized this problem by including Sec. 145 to repeal the funding restriction on *Compass Call* recapitalization, opening the door for program acceleration.[12]
- **Readiness:** While the impact of Sec. 145 and subsequent congressional oversight will have on the transition of the *Compass Call* mission to the EC-37B remains uncertain, it is important to recognize that the mission is much more than capabilities on a limited number of aircraft. The delivery shortfall has cascading effects in personnel, readiness, and training. The aircrew and maintenance personnel who conduct the mission must be ready to fight anywhere at any time.
- **Testing:** Band IV is heavily used by the public worldwide, making open-air range testing and tactical operations in theater problematic. We need to collaborate with coalition partners and allies regarding such operation in their turf.

Recommendations

Clearly, the move of the *Compass Call* program from the C-130 to the G550 airframe provides a significant advancement. However, to maximize our EW abilities with the new platform, several steps are needed:

1. Immediately begin developing a Band IV antenna system capable of withstanding the forces of *Compass Call's* new high speed and high ceiling areas of operation and compatible with the airframe of the EC-37B.
2. Rework the schedule with Gulfstream, BAE and L3 to field all ten of the EC-37B *Compass Call* aircraft faster.
3. Develop a way to test future Band IV operations in the field without interrupting public access.
4. Though EW and cyber occupy different domains, the demonstrated ability of *Compass Call* to attack networks (cyber) from the air (EW) would be a game changer. This coordination of capabilities must be leveraged further.

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