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Purpose:

This Letter of Procedure (LOP), dated 21 September 2011, establishes procedures for operation of the Northrop Grumman Corporation (NGC) Hunter Unmanned Aerial System (UAS) within the Cochise College (P03) local traffic area. NGC is considered a Department of Defense (DoD) contractor and therefore Cochise College is not liable for any damage caused during flight operations of the NGC UAS.

Background:

Northrop Grumman Hunter UAS Flight Operations have been operating at Cochise College continuously since 1993, performing thousands of hours of engineering test flights and training flights in support of the war fighter. During this time there have not been any incidents involving a Hunter Air Vehicle and a manned aircraft in this high volume student training environment. This record of success demonstrates the effectiveness of the policies and procedures in place at the NCG flight line.

System Overview:

- a. The Hunter UAS consists of an Air vehicle (AV) with a twin engine airframe (Push/Pull style) with a 35 foot wingspan. A cruise speed of 55-75 KIAS, and a maximum dash speed over 90 KIAS. The maximum service ceiling is 18,000'. The AV is controlled from a Ground Control Station (GCS) via a ground antenna with a dual data link system.
- b. AV on-board equipment:
 - (1) The AV is equipped with dual global-positioning system and an Inertial Navigation System.
 - (2) The Hunter GCS and chase aircraft are equipped with VHF radios capable of communicating on the Cochise College common traffic advisory frequency (CTAF). There are also portable handheld VHF radios available to the External Pilot.

- (3) The AV has a mode III/C transponder with altitude readout and will squawk an air traffic control (ATC) assigned beacon code and mode C altitude readout at all times. Standard VFR code of 1200 will be used during local operations.
- (4) The AV is equipped with navigation position lights and an anti collision strobe light. The strobe light will be in operation at all times while the engines are running.

General:

- (1) The NGC UAS crew will ensure the AV maintains Visual Flight Rules (VFR) while operating within the Cochise College local area as defined in 91.155.
- (2) The call sign "Hunter + Tail number will be used for all traffic calls. A GCS to Chase plane radio check will be performed prior to departure.
- (3) The NGC UAS crew will monitor the appropriate Cochise College CTAF while in the Cochise College local area.
- (4) The NGC UAS Crew will operate the AV according to the FAA issued Certificate of Authorization (COA) including altitude limits and timeframe, and within the limits defined in the Airworthiness release.

Taxi Procedures:

The Hunter UAS does not have the ability to taxi without the aid of a 4-5 person crew. These crew members help the External pilot to maneuver the Air Vehicle into the takeoff position, or vacate the runway after landing.

All preflight and engine run checks are performed in the NGC maintenance area near the NGC facilities at Cochise College. Prior to leaving the run-up area a radio call will be made to announce the Hunter Air Vehicle is taxiing from the operational sight to the active runway. Any manned traffic on the taxiway between the NGC operation site and the runway will be given the right-of-way. The external pilot and crew will taxi the AV to the Hold short line of the mid field intersection via the parallel taxiway for an External Pilot take-off. Due to the external pilots visual limitations takeoffs are not made from the beginning of the runway, instead the AV is positioned to allow for a rotation at or near the external pilot position. To reduce the taxiing time, a back taxi from the mid field intersection to the appropriate takeoff position is performed. Once traffic has been cleared a radio call for back taxi will be made. If a chase aircraft is being used it will taxi to the end of the runway with other manned aircraft and wait for Hunter to depart. Hunter typically occupies the runway for 3-5 minutes in order to

back taxi and perform the takeoff maneuver. If there is an immediate need to vacate the runway during this time the external pilot and AV crew will simply taxi the AV off the runway into the clear dirt areas toward the taxiway, or to the clear areas north of the runway. If an Auto Take-off is to be performed, the AV will be towed via the parallel taxiway to the end of the runway, and once cleared onto the runway by the external pilot, moved into the lineup and wait position. The chase plane, if used, will hold short of the runway until the Hunter is airborne and will then enter the runway for an immediate take-off behind the Hunter. The external pilot and AV crew will visually scan the traffic pattern and runway environment for other aircraft. IAW 91.113 landing aircraft are given the right-of-way. Also, aircraft holding short at the end of the runway ready for departure will be given the right-of-way. Simultaneous manned and unmanned traffic pattern operations are not permitted. The external and internal pilot will ensure the Hunter Unmanned aircraft remains on the ground clear of the active runway when manned aircraft are in the traffic pattern area.

Takeoff and Departure Procedures

The takeoff runway will be determined by the most favorable wind conditions. The designated calm wind runway 5 will be used as long as the tailwind component does not exceed 3 knots. Prior to takeoff a radio call will announce the departure from the active runway. After takeoff the Hunter AV will enter a left hand traffic pattern for runway 5 operations and a right hand traffic pattern for runway 23 operations. This ensures that the Hunter traffic pattern remains to the North side of the Cochise College campus clear of any populated areas.

If a chase aircraft is being utilized it will depart after Hunter has rotated and is climbing on the upwind leg. When Hunter is departing the local area, Hunter and chase aircraft will continue to climb in the traffic pattern maintaining visual contact with the external pilot until reaching 1000' above the TPA (6000' MSL). Once this safe altitude is obtained the Hunter and chase aircraft will announce and perform a downwind departure to the north and continue the climb to the operational altitude. During this time aircraft control is switched from the external pilot to the internal pilot. The GCS and Chase aircraft will continue to monitor and announce positions on the CTAF until above 8000' MSL or beyond 10nm from Cochise College. Visual separation from traffic via instructions from the chase aircraft will be strictly adhered to by the Internal Pilot within the GCS.

Local Traffic Pattern Operations

Occasionally training and re-currency of Hunter operators require extensive local pattern operations including touch and goes, stop and goes, and low approaches. A typical External Pilot controlled Hunter traffic pattern is 200-

400 feet below the Cochise College TPA of 5000' MSL and much closer to the airfield than a manned aircraft traffic pattern. An Auto Landing pattern is more similar to a manned pattern. It will be at the TPA on downwind and turn final at about 2 nautical miles. During an Auto Landing there will still be an External Pilot observing the Hunter and monitoring manned traffic. Simultaneous manned and unmanned traffic pattern operations are not permitted. The external and internal pilot will ensure the Hunter Unmanned aircraft remains on the ground or exits the traffic pattern to a hold area when manned aircraft are in the traffic pattern area.

The Hunter external pilot will maintain visual separation from traffic at all times and follow the right-of-way rules as defined in 91.113. Stop and Go procedures shall only be performed when manned aircraft are not in the pattern. The stop and go procedure requires the AV to be repositioned for takeoff and the arresting gear system reset. It requires as much as 7-8 minutes to complete this task, therefore it is the external and internal pilots responsibility to ensure this process does not interrupt traffic flows arriving or departing the area. During low approaches and go around Hunter will maintain runway centerline during the upwind leg.

Arrival and Landing

Hunter and Chase will enter the Cochise College traffic pattern 1000' above TPA on a 45 entry to the downwind leg. Position reports will be announced on the CTAF when 10nm out, entering on the 45, and in the pattern as required and any other times deemed necessary by the chase pilot, internal pilot or external pilot. The Chase aircraft will break off from formation as dictated by the external pilot once the external pilot has visual contact with the Hunter AV. At this point the external pilot assumes responsibility of visual separation.

A descent to the Hunter traffic pattern altitude will commence once all manned aircraft have cleared the traffic pattern area. This descent will be performed while maintaining an orbit or pattern over the airfield. Hunter requires approximately 3-4 minutes to clear the runway after a full stop, therefore the external pilot should ensure no manned aircraft are arriving or departing the airfield during that time to minimize disruptions to manned aircraft. Once a full stop has been made, the external pilot and AV crew will expedite the taxi to the mid field intersection. A clear of runway call will be made after all equipment and personnel are clear of the active runway.

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