Dryden Flight Research Center
Edwards, California 93523

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Dryden Organizational Procedure

Code O

Flight Crew UAS
Flight Operations Manual

Electronically approved by
Director, Flight Operations Directorate

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PREFACE

DOP-O-301, Dryden Flight Research Center Code O Flight Crew UAS (Unmanned Aircraft System) Flight Operations Manual is in accordance with NASA Procedural Requirement (NPR) 7900.3A, NASA Aircraft Operations Management. It is issued pursuant to the authority of the Director, Dryden Flight Research Center, and prescribes standard operating procedures and instructions pertaining to the operation of UAS assigned to Dryden and to related UAS operations involving Dryden. This manual will be used in conjunction with other governing instructions, regulations, and procedures. When the need arises, special instructions or waivers will be issued by the Director for Flight Operations. Such special instructions will be incorporated in the manual as the situation dictates.

Comments and recommendations concerning this manual are encouraged and should be submitted to the DFRC Director for Flight Operations.

CHAPTER 1: GENERAL

1.0 PURPOSE OF DOCUMENT

This document describes the management of DFRC unmanned aircraft, aircraft operations, aviation safety, and UAS and flight crew qualifications, authorization, and training.

2.0 PROCEDURE SCOPE & APPLICABILITY

Scope: This procedure applies to all Unmanned Aircraft System (UAS) operations conducted by Dryden unless specifically excluded in this document or waived by the Director for Flight Operations or the Center Director.

Applicability: This procedure applies to all personnel that maintain or operate UAS for Dryden regardless of geographic location. Specific procedures for UAS operations hosted by Dryden or conducted for Dryden by other government or contractor organizations are typically detailed in contractual documents or Memorandums of Understanding.

3.0 PROCEDURE OBJECTIVES, METRICS, & TREND ANALYSIS

Objective: Ensure aircrew qualification and proficiency
Target: 100% of aircrew are current for qualification and proficiency
Metric: Percentage of aircrew that are qualified and proficient.
Objective: UAS are operated safely
Target: 100% of UAS land as planned
Metric: Number of unplanned landings

Trend Analysis: Metrics will be analyzed to determine whether procedural objectives have been met.

4.0 WAIVER AUTHORITY

The Director for Flight Operations or Chief Pilot has waiver authority. Waivers must be submitted using form DFRC 117-1, Waiver Request and Authorization. Waivers are retained in the Flight Operations Directorate office.

5.0 MANAGEMENT RECORDS & RECORDS RETENTION

D-WK 117-1 Waiver request and authorization will be scanned and stored electronically on the I drive. Code O active waivers will be stored in the active waivers folder and waivers that have been incorporated in a procedure or are no longer applicable will be stored in the historical folder for 5 to 30 years beyond the life of the project per NPR 1441.1D:

D-WK 1672-7 Flight Log Kept by the Pilots office until transfer of the aircraft per NPR 1441.1D 7900 25B:

The following records are kept for two to fifteen years in the pilot's office per NPR 1441.1D 7900 item number 25A:

COA	Certification of Authorization from the FAA
DD Form 175	Military Flight Plan
DD Form 1801	ICAO Flight Plan
DFRC 115-7	Request for Authorization to Travel on Government Aircraft
DFRC 176-7	Authorization/Training to Fly in NASA Dryden Aircraft
DFRC 176-7b	Airborne Science Flight Participation Form
D-WK 110-8	Western Aeronautical Test Range (WATR) Support Requirements
D-WK 820-7	Flight Authorization
D-WK 821-7	DFRC, Local VFR Flight Plan
FAA 7233-1	FAA Flight Plan
FAA 8500-9	Medical Certification for Aircrew
NF 1269	Flight Itinerary and Passenger/Crew Manifest
NF 1653	Mission Management Flight Request

The following record is destroyed upon separation or transfer of employee or when 5 years old, whichever is sooner per NPR 1441.1D 3400.33H.1:

D-WK 814-7 Aircrew Qualification Record

Records are preserved, maintained, and disposed of in accordance with NPR 1441.1, NASA Records Retention Schedules, and DFRC records management procedures.

6.0 RELEVANT DOCUMENTS

6.1 Authority Documents

NPD 8621.1	NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping
NPR 7900.3	Aircraft Operations Management
08-01 (FAA)	UAPO Guidance Document

6.2 Reference Documents

AFFTC Instruction 11-1

AFFTC Instruction 11-2

Aircraft Fact Sheet or Flight Manual Supplement

Aircraft Flight Manual / NATOPS

DOC-O-009	Flight Operations Directorate
DOP-O-006	Fact Sheet Preparation and Update
DOP-O-007	Aircraft Cockpit Review
DOP-O-023	Aircraft Weight and Balance
DOP-S-001	Aircraft Mishap Response Procedure

Flight Crew Information File (FCIF)

Safety Read File

U.S. Office of Personnel Management (OPM) General Schedule Position, GS-2181: Aircraft Operation Series

6.3 Informational Documents

AFFTC In-flight Guide

6.4 Forms

DD Form 175	Military Flight Plan
DD Form 1801	DOD International Flight Plan
DFRC 117-1	Waiver Request and Authorization
DFRC 176-7	Authorization / Training to Fly in NASA Dryden Aircraft
D-WK 110-8	WATR Support Requirements
D-WK 129-7	Flight Request
D-WK 227-8c	Aviation Hazard / Incident Report
D-WK 814-7	Aircrew Qualification Record

D-WK 820-7	Flight Authorization
D-WK 821-7	DFRC Local VFR Flight Plans
D-WK 1672-7	Flight Log
FAA 7233-1	Flight Plan
NF 1269	Flight Itinerary and Passenger Manifest
NF 1653	Mission Management Flight Request

7.0 ACRONYMS

ADF	Automatic Direction Finder
AFFTC	Air Force Flight Test Center
AFSRB	Airworthiness and Flight Safety Review Board
AGL	Above Ground Level
AM	Aircraft Monitor
ASR	Airport Surveillance Radar
BLOS	Beyond Line of Sight
COA	Certification of Authorization
CP	Co-Pilot-Operator
CRM	Crew Resource Management
DOD	Department of Defense
ETA	Estimated Time of Arrival
FAA	Federal Aviation Agency
FCF	Functional Check Flight
FCIF	Flight Crew Information File
FP	First Pilot-Operator
GPS	Global Positioning System
IAW	In Accordance With
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
kt	knot
lb	pound
LOS	Line of Sight
LRE	Launch and Recovery Element
MCE	Mission Control Element

MDA/DH	Minimum Descent Altitude/Decision Height
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MSL	Mean Sea Level
NATOPS	Naval Air Training and Operating Procedures Standardization
NAS	National Air Space
NM	Nautical Miles
PAR	Precision Approach Radar
PIC	Pilot-in-Command
PSO	Pilot Sensor Operator
RC	Radio Control
RVR	Runway Visual Range
SM	Statute Miles
SP	Sensor Position
sUAS	Small Unmanned Aircraft System
SUA	Special Use Airspace
TACAN	Tactical Air Navigation
CP	Cruise / Co-Pilot-Operator
FP	First Pilot-Operator / Pilot-in-Command
IP	Instructor Pilot-Operator
UAS	Unmanned Aircraft System
SP	Second Pilot
USAF	United States Air Force
USN	United States Navy
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
VOR	VHF Omnidirectional Range

CHAPTER 2: UAS FLIGHT AND FLIGHT CREW AUTHORIZATION

1.0 DEFINITIONS

1.1. Unmanned Aircraft System (UAS)

A. An unmanned aircraft system is any airborne vehicle without a pilot onboard that is controlled autonomously by an on-board control and guidance system or is controlled from a monitoring station outside of or remote from the UAS vehicle and also meets the requirements of paragraph B below. The UAS may be controlled from an aircraft or from a ground station.

B. Additionally, UAS vehicles, for the purposes of this document, possess any one of the following characteristics:

1) Operating altitude above the FAA guideline of 400 feet

2) Operating distances greater than 1.5 nautical miles from the takeoff point

3) Capable of speeds greater than 150 knots

4) Any operations without continuous visual eye contact by the UAS Pilot-Operator (video coverage does not qualify)

5) Any operations that are autonomous and do not require guidance commands from the ground control station (not including use of autopilots that are engaged and disengaged by a ground UAS Pilot-Operator)

C. The operation of radio-controlled aircraft that do not meet any of the criteria in paragraph B above are not covered by this document unless the radio-controlled aircraft is designated as a UAS by the Director for Flight Operations or the Center Director.

1.2. Small UAS

Small Unmanned Aircraft System (sUAS) is a model or sub-scale aircraft designed and built to operate with an onboard flight management system. Small UAS may carry a variety of payloads and operate using either licensed or unlicensed spectrum for command and control. sUAS can be operated via a manual control, manually via an onboard flight management system or autonomously.

1.3. UAS Mission

A. **Research Test Missions** are flights conducted for the purpose of conducting experiments involving the basic UAS vehicle or its flight required systems. This includes experimental aerodynamic configurations, flight control system modifications or test configurations, guidance and navigation software modifications, new external pod configurations, communications system limitations, communications systems modifications, or other modifications that place the UAS vehicle into a test configuration (not including modifications that are part of manufacturer recommended or mandated upgrades to the basic UAS vehicle). The initial series of flights with a new sensor configuration may fall into this category if there are significant changes to the external configuration of the UAS vehicle that might affect aerodynamic or other characteristics. The Director for Flight Operations may specify that the vehicle is in a test configuration. Generally, UAS research test missions are flown in restricted airspace and require an AFSRB clearance prior to flight.

B. **Sensor Platform Research Missions** are flights conducted for the purpose of conducting earth science missions where sensors or cameras carried by the UAS vehicle are used to collect atmospheric, geographic mapping, earth resource, or other similar data. These flights do not involve testing of the basic UAS vehicle systems required for flight and are conducted using configurations previously cleared as airworthy. These flights may be conducted outside of restricted airspace with appropriate operating procedures coordinated with airspace controlling agencies. Typically, a series of flights for this purpose are reviewed and approved via the Operational Readiness Review (ORR) process.

C. **Other Missions** are flights, such as functional check flights, dedicated UAS flight crew training flights, or other flights to checkout sensor integration and functionality after installation. The initial series of flights with a previously approved sensor configuration fall into this category for sensor checkout. The initial series of flights with a new sensor configuration may fall into this category if there are no significant changes to the external configuration of the UAS vehicle that might affect aerodynamic or other characteristics. These flights will typically be flown in local airspace approved for UAS operations.

1.4. UAS Flight Crew

A. Primary UAS Flight Crew consist of UAS pilot, engineers, and technicians, both civil service and contractor, that are required to operate a UAS and are authorized by position descriptions, letters of

appointment, MOU, MOA, or contracts to perform UAS flight-associated duties at DFRC.

B. Secondary UAS Flight Crew are experimenters, engineers, scientists, mission UAS Pilot-Operators, and other persons who staff data collection or vehicle monitoring stations, or who provide mission control for the purpose of providing flight crew direction in the operation of payloads and experiments carried by the UAS vehicle or during the conduct of other flight experiments or maneuvers.

1.5. Weight

Based on Maximum takeoff gross weight (in pounds) for each UAS type.

1.6. Airspeed

Operational limitation for Class I type UAS (limited by maximum engine control unit (ECU) thrust setting, ECU speed limiter, autopilot limit setting or airspeed callout from a reliable source) due to aircraft performance capabilities. Class II type UAS as identified in the operating manual and per FAA regulations.

1.7. LOS

Line of sight (LOS) typically associated with RF communication direct link limitation between a transmitter and receiver. May also refer to visual line of sight (VLOS) between the controlling pilot and an unmanned aircraft.

1.8. BLOS

Beyond line of sight (BLOS) typically refers to communication link protocols that enable unmanned aircraft command and control outside of a direct link between a transmitter and a receiver.

1.9. Remote Pilot

Also called Remotely Operated Aircraft (ROA) or Remotely Piloted Vehicle (RPV) Pilot, the Remote Pilot is an individual who operates an unmanned aircraft system by means of manual control in a remotely located ground control station. The Remote Pilot typically manages the unmanned aircraft flight path through a command and control communication link using manual stick-and-rudder inputs, a forward looking video camera feed, and a moving map display system located in the ground control station. The Remote Pilot is the designated pilot in command of the unmanned aircraft.

1.10. Pilot-Operator

Also called the Ground Control Operator (GCO) or Internal Pilot, the Pilot-Operator is an individual who manages the operation of an unmanned aircraft by means of a remote flight control station (also called ground control station of GCS). The Pilot-Operator typically controls the

unmanned aircraft autonomously by means of computer interface with an onboard flight management system (fly-by-mouse) through a command and control communication link. The Pilot-Operator is the designated pilot in command of the unmanned aircraft.

1.11. RC Pilot

Radio Control (RC) Pilot (also called Safety Pilot or External Pilot) is an individual who operates an unmanned aircraft by means of a remotely located, manually operated radio controlled flight management system (direct control by means of stick-to-surface interface). The flight controller is typically commercial off-the-shelf RC hobby equipment. Radio frequencies associated with the command and control function of the system are typically in the unlicensed spectrum suite (72 MHz, 900 MHz, or 2.4 GHz). The RC Pilot is the designated pilot in command of the unmanned aircraft. An RC Pilot may also perform crew member duties of a safety (or external) pilot who acts as a fail-safe to an unmanned aircraft system that is normally controlled by a Pilot-Operator. The safety (or external) pilot flight control system is typically commercial off-the-shelf RC hobby equipment that may be either stand-alone or modified to function as a buddy box. In the buddy box configuration, the safety (or external) pilot controls the unmanned aircraft through the ground control station communication link protocol. When the safety (or external) pilot is controlling the unmanned aircraft, that person is considered the pilot in command. All flight operations are within visual line of sight of the controlling pilot.

1.12. Observer

An individual who is a primary crew member for UAS operations. The observer serves as the flight safety monitor to ensure non-interference between the unmanned aircraft and non-participating aircraft by means of see and avoid. The observer may perform these duties either on the ground on in a chase aircraft while in direct communication with the controlling pilot. Daisy chain observer operations are limited to 5 NM between the pilot in command and the airborne unmanned aircraft.

1.13. Model Aircraft

A sub-scale aircraft built from balsa wood, plywood, foam or other lightweight materials that is typically flown by means of a commercial off-the-shelf RC flight controller. Model aircraft are designed to be operated within visual line of sight of the controlling pilot. Model aircraft typically operate at a TOGW less than or equal to 55 lbs.

1.14. FRR/AFSRB

Flight Readiness Review (FRR) / Airworthiness and Flight Safety Review Board (AFSRB) is a group of cognizant, senior-level decision makers who review and evaluate the airworthiness and flight safety of a given airborne

capable system. The board receives a technical presentation from the FF with rebuttal from project personnel. Subject material reviewed include (but is not limited to): project description, operations summary, aircraft/experiment development status/readiness, ground system readiness, analyses/simulations, system safety analysis, schedule, configuration control board actions, issues/project requests. The board is typically led by the Chief Engineer and the board recommends approval to the Center Director who is the final authority for approving project flight operations.

1.15. Flight Termination System

A flight termination system (FTS) may be dependent, independent, or self-initiated. A dependent FTS uses its own command and control system to either automatically self-terminate or allow a remote pilot to terminate flight. An independent FTS contains a fully independent transmitter / receiver located onboard the aircraft that is activated remotely typically by a range safety officer. Self FTS are typically associated with COTS RC controllers that are activated upon lost link.

2.0 APPROVAL TO FLY UAS VEHICLE

The Chief, Flight Crew Branch, determines Dryden primary flight crew aircraft assignments. To fly UAS vehicles, UAS Pilot-Operators must meet the qualification, training, checkout, and currency requirements of this document. Records are kept in the pilot's flight records file maintained at the flight operations desk.

Non-Dryden UAS Flight Crew must be approved for flight by the Chief, Flight Crew Branch, and the Director for Flight Operations. Form DFRC 176-7 (Authorization / Training to fly in NASA Aircraft) is used.

3.0 NUMBER OF UAS VEHICLES FOR WHICH PILOT-OPS ARE QUALIFIED

The Director for Flight Operations, in consultation with the Chief, Flight Crew Branch, determines the number of UAS vehicles in which Dryden-assigned Pilot-Operators are qualified based on overall pilot experience, UAS pilot-operator experience, demonstrated performance, and research or operational requirements.

Non-Dryden UAS Pilot-Operators participating in Dryden research projects and flying Dryden UAS vehicles will typically fly only those aircraft directly assigned to the project.

4.0 APPROVAL OF UAS FLIGHTS

UAS research and test flights must be formally requested through form D-WK 129-7 (Flight Request) and be approved by the Director of the originating organization. These flights must then be approved by the Director for Flight Operations, who is responsible for ensuring assigned UAS flight crew meet the qualifications established by Dryden policies and procedures.

All UAS flights that terminate intentionally at an airfield other than Edwards AFB require the approval of the FAA and the airfield manager. Prior coordination is required with all affected controlling agencies and organizations (FAA, airfield management, control tower, and emergency response teams). A UAS project team will be prepositioned to receive the aircraft and coordinate local support requirements.

5.0 UAS FLIGHT CREW DESIGNATIONS

Overall qualifications for the designations below are made based on flight crew overall flight experience, experience in similar types of UAS vehicles, experience in the actual UAS vehicle type, other training, and demonstrated performance.

A. **Instructor Pilot (IP):** The Chief, Flight Crew Branch will designate UAS Pilot-Operators with appropriate qualifications and experience as UAS Instructor Pilot for each UAS vehicle type. Instructor UAS Pilot-Operators will evaluate initial qualification and annual proficiency check flights for UAS vehicles for which they are instructor qualified. Instructor UAS Pilot-Operators may perform functional check flights for UAS vehicles in which they are IP qualified.

B. **Pilot (FP):** The designation of UAS Pilot-Operator signifies full qualification in that UAS vehicle, including acting as mission commander. UAS Pilot-Operators may perform functional check flights if designated as FCF qualified for the UAS vehicle by the Chief, Flight Crew Branch. The SPAF designation of LRE Pilot-Operator (Launch and Recovery Element) indicates the full qualification level.

C. **Co-Pilot (CP):** The designation of UAS Co-Pilot-Operator signifies qualification to support UAS operations that require two UAS pilots, but not qualification to conduct UAS operations requiring only a single UAS pilot. This position can also include the SPAF designation MCE Pilot-Operator (Mission Control Element), which indicates the qualification level for “up-and-away” or cruise operations only.

D. **Second Pilot (SP):** The designation of UAS Second Pilot-Operator signifies a duty position only performed by any of the above three and is mission specific. (RQ-4 Global Hawk is an example of mission specific.)

6.0 UAS MONITORS

A highly qualified UAS Instructor Pilot-Operator will be identified by the Chief, Flight Crew Branch as the Aircraft Monitor (AM) for each UAS vehicle type.

A. UAS aircraft monitors serve as the primary point of contact with outside agencies for obtaining technical and operational information and ensuring distribution of relevant information to all assigned UAS flight crew.

B. UAS aircraft monitors will define, update, and administer the flight crew training syllabus for each UAS vehicle.

C. UAS aircraft monitors will conduct systems and emergency procedure reviews during training sessions and safety meetings.

7.0 UAS PROJECT PILOT-OPERATORS

For each UAS research flight project conducted by Dryden, a lead UAS project Pilot-Operator will be assigned. Each UAS science deployment will have an assigned lead project Pilot-Operator for each type UAS vehicle who will work flight operations issues relative to that deployment.

CHAPTER 3: UAS FLIGHT CREW QUALIFICATIONS

1.0 QUALIFICATIONS

A. UAS research test pilot-operators at Dryden are engaged in aeronautical research flight programs that may involve the application of advanced and unconventional flying techniques. It is a Dryden requirement to ensure that all these flying personnel are thoroughly qualified to operate UAS and experimental vehicles within limitations imposed on them individually, and that a systematic program of pilot-operator checkout, training, certification, and currency is maintained at all times.

B. UAS sensor platform research flight crews based at Dryden accomplish airborne science data collection by conducting worldwide flight operations. It is a Dryden requirement that each flight crew member is fully qualified to perform their duties safely and effectively in the conduct of above mentioned flights, and that a systematic program of checkout, certification, training, and currency is maintained at all times.

C. The Chief, Flight Crew Branch, and the Director for Flight Operations approve a program of training and checkout for non-Dryden UAS Pilot-Operators that operate Dryden UAS research vehicles.

D. The Director for Flight Operations ensures that all personnel assigned to UAS flight crew duties are fully qualified for their assigned duty positions. The qualifications listed below provide guidance on the minimum qualifications required for being hired as UAS flight crew members to perform the assigned position tasks. Flight crew hired for pilot-operators aircraft flight operations may be trained to perform duties associated with UAS flight crew positions as required to meet Dryden UAS vehicle and mission requirements.

E. UAS Pilot-Operators hired by Dryden must meet the requirements of Section 2.0 below.

2.0 UAS PILOT-OPERATOR QUALIFICATIONS

All candidates must meet the minimum qualification standards set forth per the U.S. Office of Personnel Management (OPM) General Schedule Position, GS-2181: Aircraft Operations Series. Refer to the OPM standards for the full text. In summary, the following qualifications apply.

A. The basic education requirement is successful completion of a standard professional curriculum in an accredited college or university and award of a

bachelor's degree or higher. In addition, candidates must possess an FAA commercial pilot license with instrument, single engine land rating, or possess a pilot and instrument rating from the armed services. At the time of initial appointment, candidates for all pilot positions must possess a current first or second-class medical certificate in accordance with FAA regulations; both meet the intent of the requirement. Selected candidates must also meet the security requirements of the position.

B. The minimum flight hour requirements are 1200 hours of total time, of which 250 hours must be pilot-in-command time, 50 hours of night flying, and 50 hours of instrument time. At least 5 of the required instrument hours must have been logged in actual instrument weather. The balance may have been acquired in a flight simulator or as other types of instrument flight time, e.g., hood instrument. Candidates must have logged at least 100 hours of time in the previous 12-month period.

C. For flight test pilots, the minimum flight hour requirements are 1750 hours of total time, of which 1150 hours must be pilot-in-command time. Flight test positions also require completion of a flight test course such as a military flight test school or the FAA flight test pilot course, or at least 1 year of experience either flight testing aircraft for engineering approval (civilian or military) or analyzing aircraft performance data. For flight test pilots, all candidates must possess a current first class medical certificate at the time of appointment.

D. Pilots-operators hired in this category are considered UAS research pilots only, and do not perform flight duties as a Dryden research pilot in piloted aircraft unless they are assigned and meet the requirements of the applicable paragraphs of DOP-O-300.

E. At the discretion of the Chief, Flight Crew Branch, and Director for Flight Operations, Dryden research pilots without prior UAS experience may checkout in UAS vehicles to perform research or sensor platform flights using a prescribed training and checkout program.

3.0 INSTRUCTOR UAS PILOT-OPERATOR QUALIFICATIONS

Generally, an aircrew member must have a minimum of 500 hours of total flight instructor experience and 50 hours of flight experience in the particular type of UAS vehicle for which an instructor designation is made prior to being designated as an instructor. The 50 hour in-type requirement may be reduced at the discretion of the Chief, Flight Crew Branch, for research test pilots flying prototype or one-of-a-kind experimental UAS vehicles based on the pilot-operator's overall experience, experience in similar UAS vehicles, and familiarization with the particular UAS research vehicle.

CHAPTER 4: UAS FLIGHT CREW TRAINING AND CHECKOUT

1.0 UAS PRIMARY FLIGHT CREW TRAINING AND CHECKOUT

A. UAS research test pilot-operators and UAS research pilot-operators (including dedicated UAS pilot-operators) who support sensor platform UAS vehicles for airborne science programs will receive qualification training under direction of a current UAS instructor pilot-operator. Other NASA Center, military, or civilian UAS instructor resources should be used in the event a current DFRC UAS instructor pilot-operator is not available. Qualification training will vary with the UAS vehicle involved, but will normally include:

1) Ground training (including UAS ground control station checkout), handbook study, attendance at formal UAS vehicle training programs, emergency procedure training, and the performance of a UAS vehicle written examination (open book).

2) Simulator training, if available, to include normal and emergency procedure training.

3) UAS vehicle checkout flights, which will include a prescribed number of UAS flights and landings (if applicable) under the supervision of a UAS instructor pilot-operator or in accordance with a formal UAS training syllabus. Additional flights may be scheduled in order to meet training and proficiency for specific science mission requirements.

4) A check ride in the UAS prior to being cleared for solo flights.

5) Solo flights, if applicable, in which a prescribed number of UAS flights in a given time are performed to complete initial checkout or gain proficiency, followed by UAS flights of a limited nature or complexity.

6) A UAS instructor pilot-operator monitored flight of a more complex nature to obtain full UAS mission qualification.

B. An initial UAS checkout training program will be developed by either the lead UAS project pilot-operator or the UAS monitor. The training program will be documented in writing and filed in the pilot's flight records file. The checkout training program will be tailored to consider previous experience in UAS vehicles, currency in similar types of UAS vehicles, previous training background, and availability of other resources to ensure an adequate level of training. The training program must include exposure to all UAS vehicle handling qualities the flight crew might reasonably encounter during routine or emergency operations without violating flight manual restrictions or limitations.

1) Each UAS flight accomplished during the checkout training program will be documented, noting completion, maneuvers performed, and proficiency level achieved, using the specific training forms for each UAS vehicle type

and form D-WK 814-7, Aircrew Qualification Record. These training syllabi are maintained in each UAS training folder in the Flight Crew Branch.

2) UAS pilot-operators who have not completed all specified ground training for a particular UAS vehicle, including attendance at ground school, may fly with a qualified UAS instructor pilot-operator for familiarization. These flights may not be counted as checkout flights for the purpose of obtaining qualification in the UAS vehicle.

3) Local UAS vehicle checkouts are allowed if deemed necessary by the Chief, Flight Crew Branch, due to scheduling constraints or other mission considerations. They will be documented in the checkout training program developed for the UAS flight crew.

4) When available, military or civilian/contract training schools will be used to provide primary UAS flight crew with ground school, simulator (if available), and flight training for UAS vehicle checkout and familiarization.

C. Qualification training is applicable to prototype UAS vehicles that have been operated by other organizations prior to the Dryden pilot-operators' checkout. In the case of prototype, experimental, or research UAS vehicles for which no formal schools are available, the services of the designers and the manufacturer's best qualified personnel will be utilized to brief and familiarize the Dryden UAS pilot-operators with the UAS vehicle, UAS vehicle systems, and ground control stations. In addition, existing UAS simulators and UAS vehicles of a similar nature will be used to give the pilot-operator as much preparation as possible for first flight in a UAS research vehicle.

D. Training for primary UAS flight crew will include crew resource management training for normal and emergency UAS vehicle operations, including using control room and other assets.

E. All activities accomplished in support of initial, requalification, and instructor checkout in a UAS vehicle will be documented on form D-WK 814-7, Aircrew Qualification Record, and kept on file in the pilot's flight records file. Additional pages used to document individual training event accomplishments will be attached, as required.

F. UAS flight crew will not perform flight duties in a position for which a documented training program has not been completed unless approved by the Chief, Flight Crew Branch, and under the supervision of a UAS instructor pilot-operator or UAS instructor flight crew qualified in that position.

G. Training activities are not approved until an individual UAS flight crew training plan is documented, reviewed, and approved by the Chief, Flight Crew Branch. Training is not complete until the form D-WK 814-7, Aircrew

Qualification Record, is reviewed and signed by the Chief, Flight Crew Branch.

2.0 UAS INSTRUCTOR PILOT-OPERATOR TRAINING AND CHECKOUT

UAS pilot-operators are designated to UAS instructor status by the Chief, Flight Crew Branch, based on overall UAS experience, experience in the particular type of UAS vehicle, experience in similar types of UAS vehicles, extensive training with contractor engineers or in contractor simulators, previous UAS instructor experience, extensive knowledge of the UAS vehicle mission, and demonstrated performance.

A. Dryden-qualified UAS instructors will normally conduct the training required for a new UAS instructor. In the absence of Dryden-qualified UAS instructor flight crew, contractor or military UAS instructor flight crew may be used to checkout Dryden UAS flight crew.

B. A syllabus of instruction is documented in writing and placed in the Pilot's flight records file. Individual UAS flight training is documented using training forms for each UAS vehicle type and kept in the Pilot's flight record file. Completed training is documented on the UAS Flight Crew Initial Qualification form and kept on file in the Pilot's flight records file. A nominal syllabus of instruction is available in the specific UAS training folder.

C. For UAS pilot-operators without previous UAS or piloted aircraft instructor experience, a UAS instructor upgrade plan will be documented, reviewed, and approved by the Chief, Flight Crew Branch, and should include training in instructional techniques and exposure to typical situations that an UAS instructor may encounter while performing instructional duties. Simulators will be used to enhance the UAS instructor upgrade training when available.

3.0 UAS FLIGHT CREW TRAINING RECORDS

To ensure that all Dryden UAS flight crew maintain the high level of qualifications and currency standards required by the Dryden Flight Research Center, the Director for Flight Operations will maintain a system of records, notices, and reports covering each individual UAS flight crew in the organization.

4.0 UAS FOLDERS

UAS aircraft training folders are maintained in the Flight Crew Branch for each UAS vehicle type flown at Dryden. These training folders contain the UAS flight crew ground

and flight training syllabus for initial UAS vehicle checkout, requalification training, and UAS instructor checkout.

5.0 NEW UAS PILOT-OPERATOR CHECKLIST

Prior to the first UAS flight of a newly assigned UAS pilot-operator, the UAS pilot-operator must complete, at a minimum, the following list of items, as required.

1. Accomplish or provide documentation of a current flight physical
2. Ensure the training officer assembles UAS flight crew flight record file
3. Complete applicable UAS vehicle open book exam
4. Complete a UAS vehicle emergency procedure review
5. Complete required reading
    - DOP-O-301
    - AFFTC Instruction 11-1
    - UAS Flight Manual
    - UAS Checklist
    - UAS Fact Sheet or Flight Manual Supplement
    - FCIF
    - AFFTC In-flight Guide
    - Safety Read File
6. Receive safety briefing from the Aviation Safety Officer
7. Ensure that an appropriate training syllabus is developed by the UAS monitor and documented in the UAS flight crew record file
8. Schedule and accomplish in accord with the training syllabus applicable UAS vehicle ground training

CHAPTER 5: UAS FLIGHT CREW CURRENCY AND PROFICIENCY

1.0 AUTHORITY TO ESTABLISH CURRENCY REQUIREMENTS

The Director for Flight Operations has the authority to establish and approve all UAS flight currency requirements for all UAS flight crew assigned to Dryden or operating Dryden assigned UAS vehicles. This includes specific requirements established for particular UAS flight research programs and UAS vehicles.

2.0 WAIVER OF REQUIREMENTS

A waiver of UAS currency requirements may be granted by the Director for Flight Operations. Such waivers will be based on a recommendation from the Chief, Flight Crew Branch, and in consideration of the nature of UAS flight operations, the particular UAS vehicle involved, and the overall qualifications of the UAS flight crew concerned. Waivers will be requested and approved in writing and filed in the UAS flight crew flight training jacket.

3.0 LOGGING OF UAS FLIGHT TIME

UAS pilot-operator qualifications for all Dryden assigned UAS vehicles are maintained by the Chief, Flight Crew Branch. Designated UAS pilot-operators log flight time as indicated in the paragraphs below using form D-WK 1672-7. UAS flight time is recorded in the Dryden Monthly UAS Flight Time Report.

A. UAS First Pilot-Operator (FP) time is logged by UAS Pilot-Operators when performing launch, cruise, and recovery operations.

B. UAS Co-Pilot-Operator (CP) time is logged by a UAS Pilot-Operators when performing UAS “up-and-away” or cruise flight operations.

C. When two FP qualified UAS Pilot-Operators fly together, only one Pilot-Operator at a time can log FP time; the other must log CP time. Both UAS Pilot-Operators can log FP time during a single flight, but the sum total cannot exceed the UAS vehicle total flight time.

D. UAS Instructor Pilot-Operator (IP) time may be logged by a UAS Pilot-Operator when performing UAS instructor Pilot-Operator’s duties during a UAS vehicle flight for which he is designated as a UAS instructor. In dual controlled UAS vehicles, a UAS Pilot-Operator may log IP time when flying with a UAS Pilot-Operator under instruction who is logging FP or CP time.

E. UAS flight time may be used to meet qualified piloted aircraft flight time requirements for DOP-O-300.

F. UAS Second Pilot-Operator (SP) or MCE Pilot-Operator time is logged by a UAS pilot-operator when seated at the PSO performing non-flying duties.

4.0 GENERAL UAS PILOT-OPERATOR CURRENCY REQUIREMENTS

Once checked-out to fly a UAS vehicle, a primary flight crew member must maintain currency by a designated minimum number of flights and training events in a given period of time. The Chief, Flight Crew Branch, or a designated representative will monitor each UAS flight crew currency. Takeoff and landing currency requirements apply to FP Pilot-Operators. General currency requirements for UAS flight crew are as follows:

A. For a UAS Pilot-Operator to be current in an aircraft, one sortie in the primary pilot-operator position and three take-offs and landings in that UAS vehicle type must have been made in the previous 90 days. A currency flight generally includes premission planning, preflight planning, ground operations planning, takeoff, landing, and one hour of PSO operations.

- The MQ-9 requires three take-offs and landings in the previous 90 days.
- The RQ-4 requires one take-off and landing in the previous 90 days.

B. After 90 days, the UAS pilot-operator must regain currency by reviewing normal and emergency procedures and UAS vehicle limitations with an IP. The flight plan will be annotated with evidence of the accomplishment of this requirement and initialed by the instructor pilot-operator and the Operations Supervisor. In the absence of a flight plan, a letter documenting the required review above will be posted in the UAS pilot-operator's flight jacket. The UAS pilot-operator then must make a landing with a current IP monitoring the landing.

C. If all UAS pilot-operators are noncurrent for a particular UAS vehicle, the senior IP available for that UAS vehicle will review normal and emergency procedures and UAS vehicle limitations with another instructor pilot-operator or a pilot-operator designated by the Chief, Flight Crew Branch. The flight plan will be annotated with evidence of the accomplishment of this requirement and initialed by the instructor pilot-operator and the Operations Supervisor. In the absence of a flight plan, a letter documenting the required review above will be posted in the UAS pilot-operator's flight jacket. The senior UAS instructor pilot-operator then regains landing currency while being monitored by the designated IP monitoring the landing. Based on the appropriate fidelity of a flight simulator, consideration may be given for using a simulator to obtain currency.

D. The Chief, Flight Crew Branch, with the concurrence of the Director for Flight Operations, may designate surrogate UAS vehicles of similar performance and handling qualities to meet the landing currency requirement for specific UAS vehicle. In this case, the landing currency requirement for the UAS vehicle may be extended to 180 days instead of 45 days if the UAS pilot-operator is current in the designated surrogate UAS vehicle. However, a normal and emergency procedures review is required and must be documented in accordance with Section 4.0-B above.

E. Over 1 year, the UAS pilot-operator must accomplish a recurrency checkout program documented in writing and approved by the Chief, Flight Crew Branch.

F. Additional UAS pilot-operator currency requirements may be established, such as simulated flameout (SFO) and nonstandard flap configuration approaches and landings, based on the specific requirements of each UAS vehicle operation.

MQ-9 Specific Requirements

REQUIREMENT	FIRST PILOT-OP / INSTRUCTOR PILOT -OP/ PIC (FP / IP)	CRIPSE / CO-PILOT-OP (CP)
Flight Physical	FAA Class I	N/A
Flight Evaluation	12 Months	12 Months
IRC	12 Months	12 Months
Basic Sortie	3/90	1/90
Instrument Approach (GLS)	3/90	N/A
IR Camera Landing	3/90	N/A
Takeoff	3/90	N/A
Landing	3/90	N/A

- **FPs** and **CPs** require currency and proficiency for their respective qualifications.
- **SP** is a duty code only. **FPs** and **CPs** can log **SP** time when performing “right seat” duties.
- Numbers are for MQ-9

RQ-4 Specific Requirements

REQUIREMENT	FIRST PILOT-OP / INSTRUCTOR PILOT –OP / PIC (FP / IP)
Flight Physical	FAA Class I
Flight Evaluation	12 Months
IRC	12 Months
Basic Sortie (simulator)	1/45
Emergency Procedure (simulator)	1/180
FPs require currency and proficiency for their respective qualifications.	
Numbers are for RQ-4	

SUAS Pilot-Operator requirements are fulfilled through manufacturers' recommendations.

5.0 UAS PILOT-OPERATOR ANNUAL FLIGHT PROFICIENCY REQUIREMENTS

A. Overall annual (calendar year) and semiannual (January through June and July through December) requirements for Dryden-assigned UAS Pilot-Operators (including contractor UAS Pilot-Operators) are as follows (references to takeoff and landing proficiency requirements are not applicable to CP Pilot-Operators):

1) Annual proficiency level is a minimum of 24 sorties or 50 hours per year in all UAS vehicles (at least half of the time as pilot-in-command). Additionally, UAS Pilot-Operators must obtain at least 12 UAS landings per year if landings are Pilot-Operator flown (not on autopilot) as either normal or emergency procedures.

2) Semiannual proficiency level is a minimum number of 12 sorties or 24 hours per six months in all UAS vehicles (at least half of the time as pilot-in-command). Additionally, UAS pilot-operators must obtain at least 6 UAS landings semiannually if landings are pilot-operator flown (not on autopilot) as either normal or emergency procedures.

3) Minimum night flying requirement per year is 2 sorties (1 sortie minimum semiannually) for UAS vehicles that are operated at night. Sorties need not be dedicated to night operations only (can be done with IR camera), but must include at least three night landings (occurring at least 30 minutes prior to sunrise or 30 minutes after sunset). Additionally, if UAS missions are to be flown that include night operations, the UAS night sortie must occur within 45 days prior to accomplishing the missions.

4) If the UAS vehicle is certified for IFR operations, the minimum number of instrument approaches is 12 per year (6 approaches minimum semiannually). Half of the instrument approach requirement per

semiannual period may be obtained by simulator instrument training. Instrument approaches should be divided equally between nonprecision approaches (TACAN, VOR, GPS, ASR, and ADF) and precision approaches (ILS and PAR), as appropriate for UAS vehicle equipment.

5) There is no established minimum number of sorties or hours in any particular UAS vehicle type, except as noted above. However, the aircraft monitor will ensure that all UAS pilot-operators receive an appropriate number of flights and landings (at an appropriate frequency) in each UAS vehicle in which the UAS pilot-operator is qualified to maintain an adequate level of proficiency in each UAS vehicle flown.

B. Military or contractor UAS pilot-operators not assigned to NASA Dryden who fly NASA Dryden UAS vehicles generally maintain the proficiency requirements of their parent organizations. However, the Director for Flight Operations determines the adequacy of those proficiency requirements when approving those pilot-operators to fly NASA Dryden UAS vehicles.

C. The Director for Flight Operations or the Chief, Flight Crew Branch, may designate certain UAS pilot-operators as “Day, VFR only”, or “Day only”. These pilot-operators will meet the requirements of paragraph 5 above, except that the night and instrument time requirements are waived, as appropriate. Additionally, the Chief, Flight Crew Branch, may specify higher IFR approach minimums for flight crew in specific UAS vehicles based on their experience and proficiency level. These designations and restrictions will be documented on the UAS flight crew initial checkout form for the UAS vehicle and maintained in the flight record file. Unless otherwise documented, the UAS pilot-operator is considered fully qualified for the UAS vehicle.

D. Failure to meet the above minimum requirements due to illness, extended or frequent travel, special assignments not involving flying, or other reasons, is documented by the Chief, Flight Crew Branch, approved by the Director for Flight Operations, and placed in the individual aircrew training folder.

6.0 ANNUAL CRM TRAINING REQUIREMENTS FOR ALL UAS FLIGHT CREW

Crew Resource Management (CRM) training is required annually for all Dryden UAS flight crew. This training will include control room mission UAS Pilot-Operators and other discipline engineers with control room responsibilities during UAS research flights.

7.0 RECURRENT TRAINING REQUIREMENTS FOR UAS PILOT-OPERATORS

A. Each pilot-operator will complete an annual instrument review and refresher class (SPAF or SPN instrument refresher training) every 12 months to review the latest information for IFR operations. A locally-prepared instrument examination may be taken in lieu of attendance at a formal instrument refresher course.

B. Every 12 months, each pilot-operator will complete recurrent training for each type UAS vehicle in which they are qualified. The recurrency training date is based on the last day of the month in which the proficiency check ride is accomplished. A period of up to three months prior to the month in which the proficiency check flight is due may be used to accomplish the emergency procedure review, UAS vehicle written examination, and UAS vehicle specific training that are linked to the annual proficiency check flight requirement. Recurrent training requirements will be specified by each UAS aircraft monitor or lead UAS project pilot-operator to include a UAS vehicle proficiency check ride to demonstrate proficiency in normal, instrument, and emergency procedures as defined and documented on form D-WK 814-7.

   A proficiency check ride requires the following maneuvers as a minimum: Flight planning, mission briefing, ground procedures, takeoff, normal and emergency landing patterns normally practiced in flight, post landing procedures, mission debriefing, and other maneuvers deemed appropriate by the UAS aircraft monitor. If instrument maneuvers are required, the following additional maneuvers will be flown as a minimum: precision (if the aircraft is ILS equipped) and nonprecision instrument approaches, and missed approaches.

   The annual emergency procedure review may be accomplished in a UAS simulator suitable for emergency procedures training under the supervision of a fully qualified UAS pilot-operator in the specific type of UAS vehicle. If a suitable simulator is not available, a table-top emergency procedure review may be conducted by the UAS aircraft monitor or lead UAS project pilot-operator with concurrence of the Chief Pilot. For UAS vehicles with multiple required crew positions, the emergency procedure review simulation should be accomplished with a full Dryden UAS crew to facilitate crew resource management training.

   Any refresher training accomplished at an approved commercial training establishment or through the military may be used to fulfill the above requirements. Check rides completed under the supervision of a qualified military or civil UAS check pilot-operator may be used to fulfill the proficiency check ride requirement for a particular aircraft if properly documented.

The above training will be documented in the UAS pilot-operator training folder.

8.0 UAS FLIGHT CURRENCY REQUIREMENTS FOR UAS NON-PILOT-OPERATOR PRIMARY & SECONDARY FLIGHT CREW

No specific flight crew currency requirements are established for nonpilot primary or secondary UAS flight crew. The UAS aircraft monitor may establish UAS flight currency requirements for these flight crew.

9.0 UAS PROJECT SPECIFIC FLIGHT REQUIREMENTS

UAS pilot-operator currency requirements for specific UAS flight research projects and experimental UAS vehicles are developed by the aircraft monitor and approved by the Director for Flight Operations, the Chief of the Flight Crew Branch, or the UAS project pilot-operator, on an individual basis. Each UAS project may have unique and project-specific flight requirements depending on the complexity of the UAS vehicle or operations.

If the complexity of the UAS research aircraft does not require a special operations plan, the general flying requirements for proficiency will prevail.

10.0 GROUNDING OF UAS FLIGHT CREW

A. Mandatory temporary grounding of UAS flight crew will occur for the following reasons until the specified corrective action is completed:

1) Flight physical overdue. UAS flight crew must complete a flight physical to resume flight duties.

2) Check ride overdue. UAS pilot-operator is restricted from solo operations (only pilot-operator controlling the UAS vehicle) in the UAS vehicle type until the check ride is completed. In multi-piloted UAS vehicles, the UAS pilot-operator is restricted from performing UAS pilot-in-command duties until the check ride is completed. In single-piloted UAS vehicles, the UAS pilot-operator must receive a check ride at the next opportunity. The Chief of the Flight Crew Branch may use discretion and waive this requirement, in writing, if a UAS vehicle is unavailable or for other unforeseen circumstances, but the check ride must be completed expeditiously.

3) No other overdue training requires a mandatory grounding, but must be waived in writing by the Chief of the Flight Crew Branch and completed expeditiously.

4) Flight physicals and training are not overdue until the first day of the month following the month in which the physical or training expires.

B. Mandatory administrative grounding: UAS flight crew involved in a Class A or B mishap while flying a UAS, or a lower severity mishap or close call that created a high possibility for death or serious injury, will be suspended from all UAS flight activities pending a review by the Director for Flight Operations. A UAS mishap due to technical problems beyond the control of the flight crew (such as vehicle loss due to a lost link, vehicle loss due to a planned and briefed hazardous test, or vehicle loss due to a software design problem) may not necessarily result in a mandatory flight crew grounding for UAS operations. The duration of and release from grounding will not exceed 30 days without referral to the Center Director for recommended further action. Further action may include:

1) Recommended continued grounding until completion of a mishap investigation

2) Convening of a flight status review board

3) Return to UAS flight status

4) This paragraph does not apply to piloted aircraft mishaps, procedures for which are covered in DOP-O-300.

C. The Chief of the Flight Crew Branch and the Director for Flight Operations have the authority and responsibility to temporarily ground UAS flight crew, in writing, for a period of up to 30 days for flight discipline or flight safety

violations or for other reasons as deemed appropriate. He/she also has the authority and responsibility to recommend permanent grounding of flight crew.

D. Upon concurrence of the next level supervisor on the recommended permanent grounding, the Center Director will be notified immediately so that he/she may appoint a Flight Status Review Board. The functions of this board are covered in Chapter 5, Section 11.0 of this document.

E. In all cases of a permanent grounding of UAS flight crew, the immediate supervisor will, within 30 calendar days of the permanent grounding action:

1) Conduct a performance appraisal review with the grounded flight crew that will include a discussion of reasons for the grounding action and annotate the performance appraisal to reflect the situation, and

2) Coordinate with management and the Dryden Human Resources Branch to effect the timely and appropriate reassignment of position duties of the affected flight crew.

11.0 FLIGHT STATUS REVIEW BOARD

A. Whenever a DFRC flight crew is removed from UAS flight status by the authority vested in relevant supervisors, that situation will be reviewed by a third party board (which may include flight crew members from other NASA Centers). This board will be appointed by the Center Director and will be disbanded after presenting their findings and recommendations to the Center Director. The grounded flight crew may waive his/her right to this review in writing at any time during the process, and in such cases, the Board will terminate at that time.

B. The Board's scope includes all elements pertinent to the grounding that are necessary to arrive at their conclusions and recommendations. However, their scope does not include personnel assignment options beyond the flight status issue. The Board should feel free to call upon any Center resources required in the course of their review.

C. All testimony, deliberations, findings, and recommendations occurring in the course of the review will be deemed confidential and distributed only on a need-to-know basis.

D. Relevant supervisors may also request of the Center Director that a Flight Status Review Board be appointed "before the fact" to aid that supervisor in his/her decision making process regarding a contemplated removal from flight status. In this case, the candidate for grounding may not waive his/her right to the review.

12.0 AVIATION SAFETY

See DOP-O-300 Chapter 11, Aviation Safety Program, for information regarding aviation safety.

CHAPTER 6: UAS FLIGHT SCHEDULING & PLANNING

1.0 SCHEDULING OF UAS FLIGHTS

UAS flights are scheduled through the Flight Crew Branch in accordance with DOP-O-300 procedures.

Dryden Flight Operations will maintain logs and other appropriate documentation to record UAS pilot-operator and UAS vehicle flight times. UAS vehicle flight time will be coded by mission type:

X-1 Research test flights

X-2 Research support flights, such as:
- Research mission training
- Instrumentation or data system checkout
- Range operations support

X-3 Maintenance functional check flights

X-4 General proficiency or program support flights

X-6 Sensor platform research flights

2.0 UAS PRIMARY FLIGHT CREW DUTY TIME

Maximum UAS primary flight crew (UAS pilot-operators, flight engineers, and technicians) duty times are shown below. UAS crew duty time is the total time a crew is on duty before the final termination of a flight. UAS crew duty time accrues consecutively and begins when a crewmember reports to his/her designated place of duty, including nonlocal travel time to the duty location (travel time that exceeds approximately 90 minutes in duration), and ends when the UAS vehicle is parked and shutdown. Each UAS crewmember must have at least twelve hours off duty after completing all UAS postflight activities prior to being required for a subsequent flight (either ground or flight duties). These requirements can be waived by the Director for Flight Operations or a designated representative on an individual basis.

A. Single piloted UAS vehicle with one pilot-operator – 12 hours

B. UAS vehicle with two qualified UAS pilot-operators (FP and CP) – 14 hours

C. Each UAS operation must be evaluated to consider the type and tempo of operations when considering maximum shift periods for flight crew. Shorter UAS crew duty times should be used to support very high or very low workload conditions. UAS vehicle should be staffed to allow for periodic breaks for all required flight crew.

D. Other personnel who have critical decision-making duties with respect to a UAS flight (such as mission UAS Pilot-Operators, senior operations representatives, flight monitors, critical data monitors, flight test engineers, and others designated by the project manager or Director for Flight Operations) have a maximum crew duty day of 12 hours unless waived by the Director for Flight Operations.

3.0 USE OF ALCOHOL AND MEDICATIONS

Consumption of alcoholic beverages is prohibited within 12 hours of assuming flight crew duties for a UAS vehicle.

Use of prescription or over-the-counter medications is prohibited for UAS flight crew on UAS flight status unless the medication is approved by the flight surgeon.

4.0 MINIMUM REQUIRED UAS VEHICLE FLIGHT CREW COMPLEMENT

Each UAS project pilot-operator will determine the minimum required flight crew necessary to support basic UAS flight operations (primary flight crew) and research requirements (which may also include secondary flight crew to operate specific sensors or experiments).

Each UAS vehicle will be operated with all required flight crew positions (both primary and secondary) fully staffed for the intended mission requirements and scheduled to avoid duty time limitations.

5.0 UAS FLIGHT CREW REQUIREMENTS

The specific UAS flight crew qualifications for the accomplishment of research flights are:

A. UAS research test flights involving the following require a UAS research test pilot-operator to fly the UAS vehicle or test points.

   1) Flight of experimental or highly modified UAS vehicles

   2) Accomplishment of specific test maneuvers involving envelope expansion, flight outside of the normal UAS vehicle operating envelope, flying qualities, unusual flight profiles, test maneuvers prohibited by the UAS vehicle flight manual (such as spins), carriage of uncertified external loads, internal or external load separation or drop tests, or precision control of UAS vehicle flight conditions. As described in Item C, these duty times include periodic rest periods.

3) Accomplishment of tests that involve the evaluation of experimental or modified flight displays or the use of specialized equipment.

4) Other UAS flights, as directed by the Chief, Flight Crew Branch, or the Director for Flight Operations.

B. The first series of flights of a UAS sensor platform aircraft with experiment loads that substantially alter the external configuration of the UAS vehicle from previously flown configurations or involve separation or drop tests require a UAS research test pilot-operator as the pilot-in-command. Once flown by a UAS research test pilot-operator and all operating restrictions for the aircraft configuration are noted in the UAS vehicle fact sheet, any qualified UAS research pilot-operator may fly subsequent flights for that UAS configuration.

6.0 FLIGHT PLANNING FACILITIES

Flight planning facilities are maintained by the Director for Flight Operations to support Dryden flight requirements in accordance with DOP-O-300, Aircrew Flight Operations Manual.

7.0 FLIGHT CLEARANCES

The UAS pilot-in-command of a Dryden UAS vehicle will ensure that a flight plan is prepared prior to every flight. The flight plan will be independently verified by a qualified air crew member and so noted at the preflight briefing. The form used will be one of the following:

A. Research flights: D-WK 129-7, Flight Request

B. Local proficiency flights in VFR conditions: D-WK 821-7, DFRC Local VFR Flight Plan

C. Flights outside of R2508 airspace:
- Military Flight Plan (DD Form 175),
- ICAO Flight Plan (DD Form 1801), or
- FAA Flight Plan (FAA 7233-1)

D. All UAS research, test support, and proficiency flights conducted within the R2508 complex or originating and terminating at Edwards AFB require an operations number from the Air Force Flight Test Center scheduling office. Flights conducted using a D-WK 110-8, Western Aeronautical Test Range (WATR) Support Requirements DD Form 175, DD Form 1801, or FAA 7233-1

and originating at Edwards AFB do require an operations number. Missions that involve deployment to other fields for an extended time do require an operations number.

E. A certificate of waiver or authorization (COA) is required for flights conducted in FAA-controlled air space (NAS)

8.0 FLIGHT PUBLICATIONS FOR UAS RESEARCH VEHICLES

UAS research vehicles are frequently highly modified to accomplish test objectives. It is critical to document those modifications that affect the operation of the UAS vehicle, including normal and emergency procedures, instrumentation system operating procedures, and flight limitations. This may be accomplished through fact sheets posted in the flight manual (for minor or temporary changes), flight manual supplements (for more extensive changes), or a complete rewrite of the flight manual (for major modifications). Normal and emergency procedure checklists should be modified or rewritten so that pilot-operator procedures, as applied to the particular UAS research vehicle, are clear to the UAS pilot-operator and supporting UAS test team in the UAS control room. It is generally undesirable to require reference to multiple flight manuals during an emergency. Therefore, whenever practical, a consolidated single document should be created for each UAS research vehicle. Mission rules or guidelines may be written by research projects that further define how UAS research vehicles are operated during research missions. Per DOP-O-006, Factsheet Preparation and Update, project UAS pilot-operators will review and sign fact sheets, locally generated flight manuals and supplements, modified checklists, and mission rules and guidelines to indicate they have been reviewed and approved for use. Fact sheets, flight manuals and supplements, modified checklists, and mission rules and guidelines will be posted in the pilots' office with the master flight manual for the UAS vehicle and at the UAS pilot station. (See DOP-O-006, Fact Sheet Update & Revision.)

9.0 UAS VEHICLE MAINTENANCE RECORDS

Each UAS vehicle will have a Dryden Aircraft Maintenance Record or will be entered into the NASA Aircraft Management Information System (NAMIS) noting the readiness of the aircraft, including status and fuel service. The Flight Preparedness Form, contained in NAMIS, will be printed, completed and signed by the UAS vehicle crew chief and readied for presentation to the UAS operations engineer and the UAS pilot-operator scheduled to fly the mission, in turn. The UAS pilot-operator will accept the vehicle as ready by inspecting the Flight Preparedness Form and signing in the appropriate place. The UAS pilot-operator may sign-off an open nongrounding maintenance item. An open grounding maintenance item may be downgraded to an open nongrounding item by approval of the Director for Flight Operations or his/her representative before flight in accordance with DCP-O-001, Aircraft Maintenance and Safety Manual.

10.0 UAS VEHICLE WEIGHT AND BALANCE FORMS

A copy of current UAS weight and balance forms for all UAS vehicles operated at the Dryden Flight Research Center will be maintained by each UAS project per DOP-O-023, Aircraft Weight and Balance. These may be computed on a flight-by-flight basis or may be computed to cover standard operating configurations for the UAS vehicle. A copy of the applicable weight and balance forms will be available at the UAS control station during flight. The master copy of the weight and balance forms are kept with the master flight manual in the Pilots' Office per DOP-O-023.

11.0 UAS PREFLIGHT AND POSTFLIGHT BRIEFINGS

A. Flight planning is an essential part of the process for conducting UAS flights in a safe and efficient manner. All UAS flights conducted by DFRC UAS vehicles will be planned and briefed appropriately to ensure thorough preparation.

B. The Crew Briefing is an essential part of the process for conducting UAS research flights in a safe and efficient manner. The crew briefing is normally the last formal briefing and presentation prior to the actual UAS research flight. This briefing is normally conducted by the UAS pilot-in-command flying the mission or each mission segment. If the flight slips more than 24 hours, a new crew briefing will be scheduled. The intent is to cover all operational aspects of the mission and to promote full understanding among all the participants. Absentees must be briefed separately prior to the actual flight. The guidelines for conducting crew briefings are listed below:

   1) For missions of duration less than 8 hours, the crew brief is normally conducted the day of the flight prior to the start of operations. However, the crew brief may be conducted up to 24 hours prior to the flight.

   2) For missions of duration greater than 8 hours involving multiple crews, the crew brief is conducted 24 to 36 hours prior to the start of operations in order to facilitate attendance by all participants and to comply with crew rest requirements.

C. The following personnel will attend UAS research flight crew briefings, as appropriate for the mission requirements (only the initial flight personnel attend the briefing for long duration flights):

   1) All required UAS flight crew members, including chase support pilots

   2) Senior Flight Operations representative

   3) Mission UAS Pilot-Operator

   4) Operations engineer

   5) Control room subsystem monitors

6) Appropriate systems engineers
7) Project scientists
8) Other personnel deemed necessary for proper mission planning and execution.

D. For long duration flights where multiple UAS flight crews are required during the course of the mission, a hand-over UAS flight crew briefing is conducted to ensure that the UAS flight crew assuming flight duties is aware of all pertinent information regarding the status of the UAS vehicle and mission prior to assuming UAS flight crew duties. This hand-over briefing is typically conducted by the departing mission UAS Pilot-Operator and UAS pilot-in-command. Additional duty station specific hand-over briefings, including significant flight events or data, are conducted by discipline engineers or scientists as appropriate for each duty station.

E. Combined Systems Tests and other ground tests in support of UAS research programs will be crew briefed. Some or all of the personnel listed for attendance at UAS research flight crew briefings will attend ground test UAS crew briefs, as determined by the test requirements and objectives. The UAS project pilot-operator, operations engineer, or project chief engineer will determine who is required prior to the crew briefing.

F. Briefing formats for different project flights may vary, but should cover the following areas:

1) Technical briefing follow up and open items
2) Weather
3) Test plan/flight profile (independently verified in accordance with Chapter 6 section 7)
4) Test cards/chase requirements
5) Mission rules/limitations/Go and No-Go Criteria
6) Aircraft status
7) Crew coordination items
8) Emergency procedures
9) Bingo and landing fuel

A generic flight briefing checklist is available from the Flight Crew Branch for projects to use in mission briefings. UAS projects may modify the briefing checklist to meet specific project and mission requirements.

G. Postflight debriefings will be conducted to discuss general flight conduct, mission accomplishments, areas for improvement or requiring further action,

UAS vehicle maintenance issues, and flight crew, control room, or experiment coordination. The postflight briefing may be broken in two parts based on crew rest requirements: (1) an initial debrief conducted by the landing UAS flight crew to discuss UAS vehicle maintenance status and mission success and (2) a debrief conducted when all participating UAS flight crew are available to discuss overall mission conduct and lessons learned. The guidelines for conducting crew debriefings are listed below:

1) For missions of duration less than 8 hours, the mission debrief is conducted immediately following the flight, if practical, or the following day.
2) For missions of duration greater than 8 hours involving multiple crews, in order to comply with crew rest requirements the mission debrief is conducted 24 to 36 hours following the flight to facilitate attendance by all participants.

12.0 UAS FUNCTIONAL CHECK FLIGHTS

A. Functional check flights are accomplished when significant maintenance or modifications have been performed to a UAS vehicle involving flight critical systems such as engines, electrical systems, hydraulics, flight controls, pitot static systems, environmental systems, and other essential systems for safe operation, or to check UAS vehicle characteristics in critical flight regimes, such as stalls. Functional check flights are normally not required for instrumentation or experiment system checkout if the integrity of flight critical systems is not affected. Flights dedicated to instrumentation or experiment system checkout are accomplished as mission support flights.

B. The following considerations will be used to determine if a functional check flight is required for UAS research vehicle (including airborne science aircraft):

1) Applicable NATOPS, SPAF Technical Order, or Production Flight Procedures Manual requirements
2) Length of time since the aircraft last flew
3) Types of modifications made to the aircraft since it last flew
4) Amount and type of maintenance performed on the aircraft since it last flew

C. Functional check flights on UAS research vehicles will be conducted at the discretion of the project manager, operations engineer, and project pilot-operator. The Director for Flight Operations or designated representative may also direct functional check flights.

D. Functional check flights on UAS research vehicle may be full or partial profiles.

   1) Full profiles will normally be flown if the UAS vehicle has not flown for an extended period of time or if extensive modification or maintenance has been accomplished since it last flew.

   2) Partial profiles may be flown to check specific UAS vehicle systems affected by maintenance or modifications.

E. Functional check flight procedures for each UAS research vehicle will be reviewed in light of vehicle limitations and modifications. Where appropriate, modified functional check flight procedures will be written. These modified procedures will be documented in the UAS vehicle flight manual, in a dedicated functional check flight checklist, or in the UAS vehicle fact sheet.

F. Specific functional check flight procedures to be followed for a UAS research vehicle will be briefed at the appropriate technical briefing (Tech Brief or Mini-Tech) prior to flight to inform management of specific maneuvers to be flown.

G. Functional check flight maneuvers will be documented in either a dedicated functional check flight checklist or on mission test cards.

H. When a partial functional check flight profile is flown on a UAS research test vehicle, it may be combined with a test mission. The mission may integrate test maneuvers and functional check requirements in any manner to facilitate mission accomplishment with the proviso that test maneuvers must not be accomplished until all applicable functional checks are completed. Generally, this will require that functional maneuvers must be flown at the beginning of the flight.

I. UAS functional check flights will be flown by a fully qualified UAS flight crew. A UAS research test pilot-operator will be used if required due to vehicle configuration modifications or planned flight maneuvers.

J. All UAS FCF tests will be accomplished in day VMC. Additionally, the airfield weather must be VFR (1500 foot ceiling and 3 miles visibility) and suitable for all planned FCF maneuvers for the UAS vehicle. This does not preclude flying through IMC to an area where VMC exists.

K. UAS pilot-operators are designated by the Chief, Flight Crew Branch, as FCF qualified in specific UAS vehicles. Generally, UAS instructor pilot-operators are FCF qualified for UAS vehicles for which they are instructor qualified. Additionally, UAS research test pilot-operators are FCF qualified in specific project UAS research test vehicle. FCF qualifications are documented in the UAS flight crew flight record file.

CHAPTER 7: UAS FLIGHT EXECUTION AND SUPERVISION

1.0 MINIMUM ESSENTIAL SYSTEMS FOR UAS VEHICLE OPERATIONS

UAS vehicle operations require all critical systems be functional. No UAS vehicle may be operated with warning lights or nonadvisory caution lights illuminated, with degraded environmental systems, with degraded or inoperative fire extinguishing systems, with degraded flight control systems (including hydraulic systems), with degraded communication or navigation systems, or with degraded flight termination systems. Prior to flight, UAS pilot-operators and project engineers will determine which systems are essential to UAS vehicle safety and mission accomplishment and adhere to those standards when deciding whether to continue or abort a mission. UAS test projects will establish mission rules to address vehicle malfunction scenarios.

2.0 UAS FLIGHTS WITHIN EDWARDS AFB AIRSPACE

Dryden UAS pilot-operators will use UHF radios to the maximum extent possible when communicating with the Edwards AFB tower, SPORT, or Joshua control within the R2508 complexes. Pilot-operators will also comply with AFFTCI 11-1, AFFTCI 11-2, and applicable MOA and MOU procedures. Deviations from AFFTCI 11-1, AFFTCI 11-2, and applicable MOA and MOU procedures will be coordinated with the 412th Operations Group commander and communicated to other agencies using the 412th Operations Group FCIF process.

3.0 CHASE AND FORMATION FLIGHTS WITH UAS

Formation flights of Dryden aircraft must take place only by prior arrangements between the pilot-operators of the aircraft involved. Normally, such arrangements must be made prior to takeoff of the aircraft involved. When an emergency or special circumstance exists or for the protection of lives, a deviation from the prior arrangement is permitted with the following precaution: The decision to operate near another aircraft in flight must be carefully weighed, considering the capabilities of the aircraft and understanding the intentions of the crews involved. In no case should the action increase the overall hazard.

4.0 UAS WIND LIMITATIONS

A. UAS projects establish wind limitations appropriate for the intended UAS operations. These limitations should consider maximum winds for flight, maximum crosswind conditions for takeoff and landing, and maximum gust or turbulence conditions for adequate flight control during critical phases of flight.

B. Touch-and-go landings are not to be performed when the crosswinds exceed two-thirds of the maximum flight manual crosswind landing limits.

5.0 WEATHER REQUIREMENTS

A. Weather requirements for planning IFR departures and determining IFR alternate requirements are specified in Tables 1 and 2, respectively. Weather requirements for executing IFR departures and approaches are specified in Table 3.

B. If there is no published approach at the destination capable of being flown with the navigation equipment aboard the aircraft, pilot-operators may file IFR to a point en route (where forecast weather is VMC at the time of arrival) or to a point served by a published approach procedure (where the pilot-operator can make a descent to VMC conditions) and then continue under VFR to the destination.

C. Regardless of weather, pilot-operators must designate an alternate airport on all IFR flight plans when the destination does not have weather reporting capability or when filing to a destination requiring any of the following to fly the planned approach.

   1) Radar

   2) GPS is the only available navigation aid

   3) An unmonitored navigation aid

D. When designating an alternate airfield that has no compatible instrument approach procedure, the forecast weather, including intermittent conditions, for the ETA (± 1 hour) must permit a VFR descent from the IFR en route altitude to a VFR approach and landing.

E. Do not designate an airfield as an alternate unless it meets the requirements of the previous paragraph if the approach required to be flown is based on an unmonitored navigation aid or the only available approach requires GPS.

Table 1. WEATHER CRITERIA FOR DEPARTURE ALTERNATE	
Airport weather, including intermittent conditions, at or above minimums for any compatible approach	Not required
With visibility below minimums, visual references must be adequate[1] for takeoff, but not less than 1,600 feet RVR for the runway in use (1/4 SM prevailing visibility in the absence of RVR). No ceiling requirement. [1]Adequate visibility is defined as runway markings or runway lighting that provides the pilot-operator with sufficient visual reference to continuously identify the takeoff surface and maintain directional control throughout the takeoff run.	**Alternate Weather, including intermittent conditions, for ETA ± 1 hour** Greater of: Ceiling: 1000 feet or MDA/DH+500 feet **and** Visibility: 2 SM or 1 SM above lowest compatible approach minimums **Aircraft having 1 engine:** Alternate must be within 25NM of departure airport. **Aircraft having 2 engines:** Alternate must be within 30 minutes of departure airport at normal cruising speed in still air with one engine inoperative.

Table 2. WEATHER CRITERIA FOR DESTINATION ALTERNATE	
Destination	**Alternate Requirements**
Weather, including intermittent conditions, for ETA ± 1 hour at or better than: Ceiling: 3000 feet **and** Visibility: Greater of 3 SM or 1 SM above lowest compatible approach	Not required
Below above criteria but above approach minimums for the lowest compatible approach.	**Alternate Weather, including intermittent conditions, for ETA ± 1 hour** Greater of: Ceiling: 1000 feet or MDA/DH+500 feet **and** Visibility: 2 SM or 1 SM above lowest compatible approach minimums For isolated airports, two hours holding fuel in lieu of an alternate airport is permitted

Table 3. EXISTING WEATHER REQUIRED		
	FOR DEPARTURE	**TO COMMENCE APPROACH (Practice approaches not authorized when weather is below minimums)**
UAS Research aircraft	As specified in fact sheet or VMC if not specified	As specified in fact sheet or VMC if not specified

6.0 UAS FUEL MINIMUMS

A. UAS projects will establish minimum and emergency fuel remaining requirements for each UAS vehicle operated at DFRC. UAS pilot-operators will plan and execute each mission to allow mission completion above the minimum fuel remaining requirements for the respective UAS. UAS pilot-operators will declare minimum fuel when it becomes apparent that traffic sequencing will result in landing at or below the minimum fuel. Pilot-operators will declare emergency fuel when it becomes apparent that a landing will occur at or below the emergency fuel unless traffic priority is obtained.

Table 4. UAS FUEL REQUIREMENTS		
UAS	**MINIMUM FUEL (pounds)**	**EMERGENCY FUEL (pounds)**
MQ-9 Predator	400	300
RQ-4 Global Hawk	1000	750

B. Bingo and landing fuels should be planned to allow landing in normal traffic sequence prior to reaching the minimum fuel. When lakebed runways are not available at Edwards AFB, bingo and landing fuels will be adjusted to allow for runway 22-04 closures that would require landing at an alternate landing site prior to reaching the minimum fuel. Use of the lakebed is for emergencies only.

C. UAS flights are planned with sufficient fuel to reach the destination initial approach fix, proceed to an alternate if required by weather conditions, and complete an approach and landing, plus 10% or 20 minutes low altitude loiter, whichever is greater (no requirement to exceed 45 minutes of loiter time). Compute fuel consumption for loiter based on maximum endurance operation at 10,000 feet. If an approach is flown at the original destination using visibility-only weather criterion, fuel must be sufficient to complete a missed approach, proceed to an alternate, and complete an approach and landing with the above fuel reserve.

7.0 ABNORMAL UAS VEHICLE OPERATIONS

A. The practice of in-flight emergency procedures, such as simulated engine flameout landings, simulated engine-out landings, actual engine shutdowns and restarts, etc., may be accomplished for training or evaluation flights with prior preflight planning and UAS project approval.

B. Practice emergencies should not be initiated below a safe altitude when considering aircraft performance, degraded flying qualities, and UAS flight crew proficiency level. In no case should practice emergencies be initiated below 200 feet AGL unless performed as part of an approved syllabus.

C. Aircraft operations without all normal flight critical systems fully functional as defined by the UAS vehicle flight manual are prohibited without approval of the Director for Flight Operations.

8.0 SUPERVISION OF UAS FLIGHT OPERATIONS

UAS flight operations are supervised in accordance with DOP-O-300 procedures. For UAS flight research test missions, a mission UAS Pilot-Operator who has completed a documented mission UAS Pilot-Operator training program may be used as the flight monitor for both test and chase aircraft.

CHAPTER 8: SMALL UAS OPERATIONS

Instructions:
The following information describes the Small UAS test area operating rules as defined by the NASA Dryden Flight Research Center (DFRC). The purpose of this document is to provide the user with guidelines necessary to safely operate a small unmanned aircraft system within the Edwards AFB restricted airspace complex at designated sUAS operating areas.

1.0 sUAS OPERATIONS PROCEDURES

A. Hours of Operation

1) sUAS operations will normally take place between the hours of 0700 local until 25 minutes after official sunset.

2) After normal hours operations may be scheduled (as necessary) as coordinated through the responsible DFRC program manager or designated oversight representative.

B. Days of Operation

1) sUAS operations will take place Monday-Friday (except official holidays).

2) sUAS operations during weekends may be scheduled (as necessary) through the responsible DFRC program manager or designated oversight representative.

C. Communications

1) The pilot is responsible to maintain communications with Edwards Tower or SPORT (as applicable) at all times during flight operations. Normally, two-way VHF/UHF radio or land mobile radio is required as primary means of communication, with cellular phone as back-up. Operations at the Rosamond North UAS Area operating under Muroc Model Masters rules (at or below 500 ft AGL) do not require communications with tower.

2) The DFRC designated oversight representative will contact DFRC flight operations to open/close mission ops number prior to UAS launch during normal duty hours.

3) Outside of normal duty hours, the DFRC designated oversight representative will contact CONFORM (661) 277-3940 or Command Post (661) 277-3040 (as appropriate) to activate/close the mission ops number.

D. Airspace

1. The air vehicle must be flown entirely within restricted airspace (Exclusive Use Airspace, such as: UAS Work Area, Rosamond North or South, Alpha Corridor, PIRA, etc.) such that separation of other aircraft and the UAS is positively controlled.

E. Frequency Management

1. Operate on approved/scheduled frequencies only.
2. All operating RF equipment and frequencies utilized in the conduct of sUAS flight operations must be approved by the DFRC Spectrum Manager.
3. Approved operating frequencies and other test asset requirements will be scheduled by the DFRC designated oversight representative through DFRC flight operations via the Western Aeronautical Test Range Support Requirements (WATR 110-8) form.
4. DFRC project personnel will submit WATR change requests to the DFRC designated oversight representative at least 24-hours in advance of the scheduled radiation start time.

F. Security

1. All personnel present at the test area must obtain and display their DFRC or AFFTC Visitor Badge at all times while in the test area.
2. Flight tests occurring at Rosamond North may use an approved 95th ABW/SFS Entry Access List (EAL) in lieu of badges. Company identification badges and state issued driver's license are required to be available to base security forces EAL accountability.
3. All personnel present at a designated sUAS test area will comply with Edwards AFB security forces directives for entry/exit and guidance provided by the DFRC designated oversight representative.
4. All nongovernment vehicles accessing lakebed sUAS test areas will display a valid Edwards AFB flight line vehicle pass obtained from Edwards Base Operations (not applicable at Rosamond North UAS Area).

G. Mission Rules

1) Weather

a) VFR flight rules apply.

b) Test teams will ensure the UAS is operated within the defined wind limitations for that air vehicle.

c) Test teams will ensure the UAS is operated within the environmental conditions limitations as prescribed by the UAS operating manual or similar documentation.

2) Aircraft

Pilots will operate the UAS in a manner that minimizes risk to personnel and/or equipment.

3) Personnel

The designated test director will report to the DFRC designated oversight representative the qualifications for all personnel performing sUAS flight operations at sUAS designated test areas prior to conducting flight activities.

4) Required Equipment

a) An operable fire extinguisher must be present at all times during test activities.

b) An operable flashlight must be available to crews operating before sunrise and after sunset.

5) Crew Briefing

a) The mission manager and project pilot will conduct a pre-mission brief that will include all personnel in the test area on the planned flight operations.

6) Safety

a) During flight test operations, all personnel will remain vigilant toward safety. Any attempt to conduct an unsafe act should be questioned and reported immediately to the test director and DFRC designated oversight representative.

7) Test Area

Teams operating at DFRC designated sUAS test areas will ensure that the area remains free of test-related debris following test area use.

H. Abnormal/Emergency Procedures

1) Rogue Aircraft (Fly Away)

a) If the operating pilot's ability to control the air vehicle is lost (C2 fails), the vehicle's fail safe mode must be programmed by project personnel to activate following any time-out period to prevent the vehicle from departing the test area or endangering personnel and/or equipment.

b) If the position of an air vehicle cannot be confirmed either through the ground station or by means of visual identification, the vehicle's fail-safe mode must be programmed to activate, preventing a fly away condition.

c) In the event that the air vehicle exits the designated test area under a fly away condition, the pilot is responsible to notify Edwards Tower (661) 277-2122 immediately. Provide as much information on location, direction of travel, altitude, and expected vehicle behavior as possible.

d) The DFRC designated oversight representative can call for flight termination, “dead man” switch activation or a similar type of fail-safe mechanism at any time he/she deems appropriate to prevent test area boundary violations or if the air vehicle flight path endangers personnel and/or equipment.

2) Mishap Plan.

a) Test Area Mishap – No Collateral Damage

- The aircrew and control room personnel will comply with the approved company mishap plan or NASA Dryden DCP-S-001 (as appropriate). Mishap actions are identified in the DFRC sUAS mission rules.
- The aircrew and control room personnel will notify DFRC designated oversight representative immediately.
- The DFRC designated oversight representative will notify appropriate NASA government personnel (Dryden management) as time permits.

b) Test Area Mishap – Collateral Damage

- If a fire exists as a result of an air vehicle crash landing, first responders will attempt to extinguish the fire (if possible) and dial 911 to report the incident.
- If injuries occur as a result of an air vehicle crash landing, first responders, dial 911 to report the incident.
- First responders Notify Edwards Tower (661) 277-2122. Provide as much information on location of incident as well as current situation of air vehicle, fire, personnel injuries, damage to ground vehicles/structures, etc.
- First responders Notify DFRC designated oversight representative (as time permits).

c) Outside Test Area Mishap

- If the air vehicle becomes a rogue aircraft (fly away) and/or crash lands outside of the designated test area, the aircrew and control room personnel will comply with the approved company mishap plan or NASA Dryden DCP-S-001 (as appropriate).
- The aircrew and control room personnel will notify Edwards Tower (661) 277-2122. Provide as much information on location, direction

of travel, altitude, expected vehicle behavior, and mishap location as possible.

- The aircrew and control room personnel will notify DFRC designated oversight representative (as time permits).
- RF Interference
- The aircrew and control room personnel will contact DFRC spectrum management office (661) 276-2138/2947/2717/3151 during normal duty hours (0700-1600L, Mon-Fri).
- After duty hours, the aircrew and control room personnel will contact DFRC spectrum management at (661) 810-4961 or 4960.
- If no answer after attempting to contact DFRC spectrum management office, the aircrew and control room personnel will contact AFFTC spectrum management at (661) 277-4756 or (661) 810-4858.

CHAPTER 9: MEDICAL REQUIREMENTS

ANNUAL PHYSICALS

A. The requirements, standards, and processes for flight medical certification at DFRC are delineated in DCP-X-048, Flight Medical Certification. For these purposes, DFRC UAV primary flight crew are considered to be NASA pilot-operators. Likewise, secondary UAS flight crew are considered to be "Other Primary Aircrew". Specific procedures for medical qualification are detailed in Sections 7.1 and 7.3 of the referenced DCP-X-048, respectively.

B. It is the responsibility of the individual UAS flight crew to schedule his/her physical examination prior to the expiration of his/her present qualification.

RECORDS

The Chief, Flight Crew Branch, will maintain a record of the individual's flight medical certification in the Life Support Office.

ADDITIONAL REQUIREMENTS

DFRC primary and secondary UAS flight crew must be evaluated at the DFRC health Unit before resuming flying activities after any one of the following:

A. Evaluation and/or treatment in an Emergency Room

B. Admission to (and release from) a hospital

C. Starting a new prescription medication given by their private medical doctor

Attachment A – NASA HQ Unmanned Aerial System Policy Direction

NASA Headquarters Aircraft Management Division has established it's policy pertaining to UAS categories, flight operations, operator requirements and definitions. This policy is incorporated into NPR 7900.3.B

Document History Log

This page is for informational purposes and does not have to be retained with the document.

Status Change	Document Revision	Effective Date	Page	Description of Change
Baseline		03-23-07		
Revision	A	01-08-09	All	• Added to requirement document list • Chapter 5, Section 4: added pilot currency requirements • Chapter 5, Section 5: changed landing requirements • Chapter 6, Section 7: changed operational procedures • Chapter 7, Section 6: changed operational procedures • Updated form numbers
Admin Change	A-1	01-22-09	All	• Corrected inaccurate revision designation (Baseline to A, now A-1) • Added *pilot-* to *operator* on pages 16 and 20
Revision	B	10/29/09	All	• Changed acronyms UF to FP, UC to CP, UI to IP, US to SP • Changed mission types U1 to X1, U2 to X2, U3 to X3, U4 to X4, U6 to X6 • Updated Chapter 5, Section 10 Grounding of UAS Flight Crew • Complete rewrite of Chapter 8 • Removed reference to D-WK 925-7 and replaced with D-WK 1672-7