



Dryden Flight Research Center
Edwards, California 93523

DOP-Y-003
Revision F

Dryden Operational Procedures

Code Y

Mission Development and Implementation

Electronically approved by
Director, Airborne Science

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1.0 PURPOSE OF DOCUMENT

This procedure establishes the process for mission development and implementation and the responsibilities of individuals involved (Mission Managers, the Program Manager, and the Directorate office).

2.0 SCOPE & APPLICABILITY

This procedure shall be applied to all Dryden Flight Research Center conducted airborne science missions.

3.0 PROCEDURE OBJECTIVES

The objective of this procedure is to establish a uniform process for airborne science mission execution.

4.0 REFERENCES

DCP-X-008	Tech Brief and Mini-Tech Brief
DCP-X-009	Airworthiness and Flight Safety Review
DCP-X-020	Operational Readiness Review
DOP-Y-006	Airborne Science Configuration Control
DOP-Y-007	Airborne Science Configuration Control Board Process

5.0 GENERAL POLICIES

- A. The format for all Airborne Science correspondence, records, and presentations will be consistent whenever practical (i.e., diplomatic clearances, questionnaires, Tech Briefs, and operational readiness reviews).
- B. The Directorate office is responsible for overall Airborne Science platform scheduling, mission assignments, and committing resources. The Directorate's current year and five-year schedules are considered master schedules, and all other schedules should be consistent with those.
- C. The Directorate office has the sole responsibility for communications at the directorate level and above regarding Airborne Science policies, resources, schedules, and concerns/issues.
- D. Mission Managers are responsible for assigned campaign/mission implementation and success and therefore are the campaign/mission's

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communications focal point during missions. As the focal point, the Mission Manager will be the official source for mission-related information.

6.0 MISSION DEVELOPMENT

6.1 Information Assembly

Frequently the first knowledge of an impending mission will be a telephone call or e-mail to a Mission Manager requesting a budget estimate to support an investigator's response to a NASA Research Announcement (NRA). The call recipient should urge the caller to submit a Flight Request. See Section 8.0 for budget information. The Program Manager provides the Mission Manager with approved flight requests and schedule parameters for mission development and implementation. The Mission Manager contacts the Flight Request submitter and determines whom the Principal Investigator or technical points-of-contact are and sends them the Experimenter Questionnaire. Flight requests and the returned Experimenter Questionnaires are studied to gather information regarding the mission.

6.1.1 Mission Participants

From the Flight Requests and the Experimenter Questionnaire, develop a list of Principal Investigators, Mission Scientist, and Science Sponsor (funding source) and/or technical points-of-contact. Expand the list to include e-mail addresses, postal addresses, FAX, and phone numbers. Contact the PIs and/or technical points-of-contact and send them the Experimenter Questionnaire. Each participant must be sponsored under a NASA grant or letter of agreement.

6.1.2 Multiple Flight Requests & Flight Hours

As many Flight Requests as is practicable should be grouped together to form a campaign. Payload compatibility and data collection conditions will dictate the extent that this is possible. The Program Coordinator tracks the Headquarters approved flight hours.

6.1.3 Dates

The flight requests are used to establish the dates of the mission. Any special conditions associated with the flight requests, including time of year, time of day, or weather constraints, need to be considered.

6.1.4 Flight Requirements

Gather the geographic locations and profiles needed for the mission from the flight request and the Principal Investigators. Consult Flight Operations for assignment of a Project Pilot and advise flight crews of the mission. Note whether proposed flight paths require penetration of any foreign, congested, or restricted airspace. International clearances must be arranged for flight in foreign airspace, with or without data acquisition, as well as landing at and operating from a foreign base.

6.1.5 Integration Engineering

The Mission Manager will conduct a kick off meeting with contractor design engineering as soon as a mission payload is known or when an out-year experiment is brought to the Directorate's attention. Complex experiments may require a site visit by engineering where telecommunications will not suffice to address all integration issues.

6.2 **Mission Schedule**

A mission schedule is prepared in accordance with the Mission Manager checklist (contained in Airborne Science Handbook). Mission Managers will plan missions within the schedule parameters (par. 3.2) set by the Directorate office. Any requirements/requests that exceed those parameters must be coordinated and approved by the Directorate office. This schedule will take into account any necessary lead times for fabrication, integration, crew restrictions, or international clearance requirements. The schedule is in a calendar format and identifies major milestones for the campaign from experiment arrival at the integration facility until the end of the download at the completion of the mission or campaign. In addition to upload, integration, shakedown, operational check flights, planned deployment, and science flights, local holidays and other events that could adversely impact the schedule should be noted. Many revisions will be required as the mission progresses and evolves. The Lead Mission Manager has sole responsibility for the preparation and promulgation of this document, and it should be distributed to each affected party to include matrix organizations at DFRC, experimenters, and throughout the Directorate and contract support.

6.3 **Meetings**

- A. Mission Managers should attend Science Meetings when the subject of flight operations is on the published agenda in order to advise science planners on flight operational issues and keep abreast of the evolving requirements.
- B. When investigators arrive for integration, a meeting is convened each day. This meeting should be kept brief and attended by representatives of each

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science team, ground crew, Flight Operation branch, Operations Engineering branch, and the design engineering contractor.

6.4 Site Survey and Logistics Support

- A. A site survey will be conducted where a location has not been used recently or conditions have changed extensively. A logistics and support checklist will be used to ensure all deployment needs are addressed. Special attention is due when the planned missions are in a different climatic season than the site survey. The survey team consists of the Mission Manager, contractor logistics manager, and, where advisable, the Project Pilot.
- B. Some campaigns have a Program Office for multi-agency logistics coordination. The Mission Manager should ensure that the site survey is concurrent with any site visit by the Program Office.
- C. The Mission Manager prepares a site survey report and distributes it to the Directorate office.
- D. Site Requirements
 - 1) The Mission Manager determines the suitability of a candidate deployment site. Among many factors are security, safety, crash rescue, fuel, power carts, hangar space, heaters and coolers, aircraft servicing (sewage disposal where applicable), and flight operations support. Experiment needs such as consumable gasses, cryogenes, shipping data tapes, and specimen containers must be addressed. If a field science laboratory is planned, lab space, office space, furniture, Internet connections, phones, FAX, and hazardous material storage needs must be assessed. Checklists must be employed and defined roles and responsibilities must be assigned and accepted by each Agency, contractor team, Project Office, and Host Country that is involved.
 - 2) The Mission Manager must address personnel logistics requirements and comfort to include passports, visas, vaccinations, security issues, hotel accommodations, transportation, and flight snacks. Intemperate climates, extended work days, unusual hours, long commutes from lodging to the airfield, disruptive noise, and foreign diets are all factors in site and lodging selection.
- E. Prior to deployment, the Mission Manager will contact the Flight Surgeon and the Security Office, check State Department and Homeland Security for advisories, and schedule a briefing for all travelers to address safety, security, disease prevention, and local customs such as offensive body movements and tipping practices.

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7.0 EXPERIMENT INTEGRATION

- A. Identify the experiment's purpose, characteristics, and hazards, using the Experimenter's Questionnaire, and if it is a previously considered experiment, the experiment's existing files. Prepare an Experiment Preview form Y-004 for each experiment. Conduct a Preliminary Hazard Review presenting the Experiment Preview to the members identified in DOP-Y-006, Airborne Science Configuration Control. Present the Experiment Previews to the Chief Engineer. The Chief Engineer will decide if an Airworthiness and Flight Safety Review Board review of experiments and aircraft modifications is warranted.
- B. Prepare one Configuration Change Request form DFRC-10 for the entire payload IAW DOP-Y-006.
- C. Determine the experiment's requirements such as probes, sensors, antennas, lasers, rack sizes and types, storage boxes, windows, and power needs using the Experimenter's Questionnaire and existing files. Coordinate solutions with design engineering, warehouse staff, the window custodian, Operations Engineering, and crew chiefs. Generate Support Requests IAW contractors' processes.
 - 1) Estimate experiment integration time. Consider off-aircraft facility requirements for data processing, equipment maintenance, and fabrication lead times. Include window tests and laser calibrations.
 - 2) Estimate the number of experiment checkout and calibration flights required.
 - 3) Prepare a comprehensive mission (campaign) schedule. The Mission Manager's checklist provides detailed guidance on items to be considered. When feasible, avoid scheduling that requires weekend travel for contractors.
 - 4) Lead the construction of the presentation for the Airworthiness and Flight Safety Review Board review of experiments and aircraft modifications in accordance with DCP-X-009 if directed by the Chief Engineer during the Experiment Preview.
 - 5) Lead the presentation to Configuration Control Boards held for his/her assigned mission IAW DOP-Y-007.
 - 6) Lead an Experiment Conformance Review and ensure an Experiment Conformance Review report (ECR) form Y-007 is written. The review will assess whether the experiment meets the requirements stated in the

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Experimenter Handbook. Participants should include the members identified in DOP-Y-006 plus the Crew Chief. The ECR will accompany the experiment during integration until final installation inspection.

- 7) The Chief Engineer will decide if a Technical Brief is required, lead the presentation of material to the Technical Brief audience in accordance with DCP-X-008, and ensure Form Y-002 is signed. If required, the Technical Brief precedes the first shakedown or operational check flight.
- 8) Lead the presentation to any Operational Readiness Review as required by DCP-X-020.
- 9) Verify that all site support and personnel logistics items are in order for deployments.
- 10) Prepare and update a flight crew checklist for powering up and powering down experiments and any special actions to be taken during a science flight. Crew use may vary, depending on aircraft. For example, the pilot uses this checklist during ER-2 missions and the Mission Director on DC-8 missions.

8.0 COST ESTIMATES

There are two categories of flight requests or methods of funding science flights. Each platform has two flat rates per hour for its flight time. NASA Headquarters sponsored flight hours are subsidized, and flying time is funded directly from the Headquarters sponsor. Any other entity must reimburse Airborne Science for the expense of conducting a mission or part of a mission at a higher full cost rate.

All other costs incurred during mission preparation or execution are charged against the flight request sponsor. Examples of such costs include cost of site surveys, aircraft ground support, engineering, logistics support, contractor travel and overtime, materials, and fuel cost for any charges in excess of the government rate. These are called "Mission Peculiar Costs" (MPC). Experimenters who do not wish to direct the time or place that the aircraft flies are called "piggy-backers" and are only assessed MPCs.

- A. Gather cost information to determine MPC.
- B. Develop preliminary cost estimates and provide the Directorate Resource Analyst with estimates. The Resource Analyst provides the estimate to the Directorate Office.
- C. Track and update MPCs.
- D. MPC estimates will be reviewed and released from the Directorate office.

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9.0 MISSION IMPLEMENTATION

Airborne Science management is the approving authority for all Airborne Science platform flights. This policy is dictated by the impact that can result on Airborne Science commitments and resources. The assigned Mission Manager approves Science mission flights, including functional check and pilot proficiency that directly support science missions. If a Mission Manager is not available or assigned, the Directorate office can approve non-science mission related flights. The assigned Mission Manager at the weekly Airborne Science status meeting will brief proposed flight schedules.

A. ER-2 Mission Implementation. Mission Managers will

- 1) Brief affected parties of experiment hazards.
- 2) Notify the experimenter of any experiment that is damaged, lost, or unsuitable for installation.
- 3) Participate in the science team meetings to determine science mission requirements.
- 4) Maintain a current pilot's checklist.
- 5) Conduct preflight briefing to review and approve the proposed flight. The Mission Manager will document approval using form Y-001.
- 6) Conduct a mission debrief after any flight.
- 7) Prepare and distribute a status report (DFRC 137) giving cursory information about the flight, to include mission results and aircraft status.
- 8) DC-8 Mission Implementation. Mission Managers will perform the following duties as the DC-8 Mission Director:
 - a) Brief flight participants on experiment hazards, aircraft egress, and flight safety.
 - b) Notify the experimenter of any experiment that is damaged, lost, or unsuitable for installation.
 - c) Participate in the science team meetings to determine science mission requirements.
 - d) Conduct preflight briefing to review and approve the proposed flight. The Mission Manager will document approval using form Y-011.

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- e) Develop the manifest using Form Y-011, ensure that the flight engineer enters weight and balance data, the Pilot in Command signs it, and that it is faxed to Dryden Flight Operations Directorate prior to the flight.
 - f) Ensure that flight participation forms and crew safety briefings for experimenters are accomplished.
 - g) Operate the Mission Director's console as required during the mission.
 - h) Conduct a mission debrief after any flight.
 - i) Prepare and distribute a status report (DFRC 137) giving cursory information about the flight, to include mission results and aircraft status.
- 9) UAV & Pilot Optional Mission Implementation. Mission Managers will
- a) Chair the Payload Configuration Control Board and Hazard Review Board.
 - b) Brief affected parties of experiment hazards.
 - c) Notify the experimenter of any experiment that is damaged, lost, or unsuitable for installation.
 - d) Participate in the science team meetings to determine science mission requirements.
 - e) Maintain a current pilot's/operators checklist.
 - f) Conduct preflight briefing to review and approve the proposed flight. The Mission Manager will document approval using form Y-005.
 - g) Conduct a mission debrief after any flight.
 - h) Prepare and distribute a status report (DFRC 137) giving cursory information about the flight, to include mission results and aircraft status.

10.0 CLOSE OUT ACTIVITIES

10.1 Local Area Missions

- A. Allocate flight hours to specific flight request(s) and provide to the Program Coordinator.
- B. Verify the actual MPCs with the Resource Analyst.

10.2 Deployed Missions

- A. Allocate flight hours to specific flight request(s) and provide to the Program Coordinator.
- B. Verify the actual MPCs with the Resource Analyst.
- C. Document a summary of mission highlights and recommendations.

11.0 FORMS

DFRC 137	Airborne Science Flight Report
DFRC 10	Configuration Change Request
Y-001	Airborne Science Flight Authorization (ER-2)
Y-002	Airborne Science Tech Brief Flight Request
Y-004	Experiment Preview
Y-005	Airborne Science Flight Authorization (UAV & Pilot Optional)
Y-007	Experiment Conformance Review
Y-010	Airborne Science Flight Participation
Y-011	Airborne Science Flight Itinerary and Passenger Manifest
NASA 1167	Foreign Travel form for DFRC Civil Servants

12.0 OFFICE OF PRIMARY RESPONSIBILITY (OPR)

OPR for this document is the Program Manager.

13.0 PERFORMANCE METRICS & TREND ANALYSIS

There are two performance measurements observed by the Airborne Science Directorate and reported to Headquarters. The Manager for Suborbital Platforms reports key science deployments to the Directorate. The deployment date is determined, and the assigned Mission Manager is required to deploy the aircraft within two weeks of that date.

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The second measurement is mission or campaign flight hours. The Directorate determines the number of funded flight hours for a mission or campaign. The assigned Mission Manager records accumulated flight hours and reports the total at the end of the mission or campaign to the Director. Funded hours and flight hours accumulated are reported to Headquarters at the end of the year.

14.0 MANAGEMENT RECORDS & RECORDS RETENTION

The Mission Manager will maintain complete records in loose-leaf binders for a mission series or campaign. The records serve to archive missions, provide references for future mission planning, and are the working documents for the mission. Binders will be separated by content and several binders may be required for each category. These records deploy with the Mission Manager. The binders are archived together with previous mission binders at mission completion.

14.1 Mission Manager Binders

- A. The Experiment binder is a cradle-to-grave record of the experiment over its entire life. Mission Managers maintain the record for the period of time that the experiment is under their auspices. The binder contains all material generated by Dryden processes, permits, and integration information. This binder is edited for obsolete information and updated as the experiment evolves over its life.
- B. The Administration binder contains all planning material, each of the documents required by Dryden processes for the campaign, clearances, external correspondence, and an experiment layout/floor plan.
- C. The Flight binder documents for each science flight, with flights separated by dividers.

14.2 Directorate Records

An Airborne Science Directorate Support Specialist will maintain a mission records file of original documents. These documents serve as official records for external audit and as backups for the Mission Manager in the field should the working documents be lost. The Mission Manager is responsible for supplying documents to the Support Specialist. The file will contain the following records where applicable:

- Flight Requests
- Experimenter Bulletin
- Chief Engineer correspondence
- Technical Briefing with signed Form Y-002
- Operational Readiness Review with Code O approval letter
- Experimenter Safety Briefing roster (with signatures)

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- Foreign Diplomatic Clearances
- Letters of Agreement
- Letters of Non-objection to Airborne Science flight activities (i.e. FAA laser letters)
- FAA Certificate of Authorization (COA) for UAV operations
- Military basing Statements of Work for deployment support
- Flight reports
- Notification of damaged customer supplied equipment
- NASA form 1167 (Foreign Travel form) if applicable

14.3 Visiting Personnel Records

For each campaign, an Airborne Science Directorate Support Specialist will maintain a binder that contains the documentation required to gain access to the Building 1623 complex. These forms include

- Form 735 A or B Visit Request for each non-Dryden person
- Form 700 Dryden Area Access and Access Card Request for each non-Dryden person