Dryden Flight Research Center
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DRYDEN CENTERWIDE PROCEDURE

CODE S

HAZARD MANAGEMENT

DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Canceled)	Document Revision	Effective Date	Description
Draft			
Baseline			

Hazard Identification, Tracking and Reporting

1.0 PURPOSE:

1.1 To describe the details, requirements and procedures for the Dryden management of hazards for flight vehicles.

1.2 To describe the preparation and processing of the Hazard Report (HR) Form.

2.0 GENERAL:

2.1 A hazard is the presence of a potential risk situation caused by an unsafe act or condition. All identified hazards are evaluated for their criticality and for the probability of occurrence.

2.2 Background:

There are many techniques used by the government and industry, all developed through a systematic system safety approach, to reduce the hazards, thus risks, associated with flying airplanes. It is obvious that there are inherent risks associated with the flight test process. All risks cannot be eliminated.

We must note that it is just as easy to over-analyze a system as it is to neglect some meaningful analysis. The Dryden approach has been to tailor industry and government accepted processes (including Mil Spec and NASA Handbooks) that are relevant, practical and efficient to form a Dryden Hazard Management System that endures.

The hazard identification tracking and reporting process at Dryden is used to ensure that all hazards associated with projects are discovered, addressed and the risks minimized to the fullest extent practical. Through various processes hazards are eliminated, reduced to an acceptable level of risk or are presented to Dryden management to become accepted risks.

3.0 SCOPE:

This document shall apply to all flight projects under the cognizance of the Dryden Flight Research Center. Hazard reporting shall be accomplished per Attachment 1 of this document. Use of Hazard Report, dated 1/96 without alteration, is required of all projects at DFRC.

4.0 HAZARD IDENTIFICATION:

A majority of the hazards associated with a project are identified early in the design and development phase through the use of formalized hazard analysis techniques. Typically, the vehicle contractor will do the analysis and correct and control identified hazards prior to the delivery of the vehicle or test article. The results of the hazard analysis must be presented at the various design reviews. A copy of all analysis must be part of the aircraft deliverables.

Hazard identification, analysis, and reporting does not terminate at delivery. The hazard analysis process, like the entire safety process must be an on-going active "living" process if it is to function correctly.

Through the life of the program, analysis must constantly be reviewed for currency and accuracy. This is especially important since Dryden's flight vehicles, due to the nature of flight research programs, are continually undergoing configuration changes.

Typically the Discrepancy Reporting (DR) system is an on-going means of identifying problems that may be hazards. DR's must be reviewed not only to ensure that they are corrected, but must be compared with known hazards to ensure that a new hazard has not been identified. If a new hazard has been identified, a Hazard Report must be initiated.

5.0 HAZARD CLASSIFICATION:

The impact of a hazard and the resulting action by the contractor, project management or Dryden Senior Management is dependent upon the criticality of the hazard and the probability of that event occurring.

There are many methods that have been developed to show the relationship of hazard severity to probability. Dryden has adopted a method tailored after the NASA System Safety Handbook DHB-S-001.

5.1 An action matrix has been prepared to aid in the hazard management process for two types of aircraft - piloted aircraft and Unoccupied Aerial Vehicle (UAV). See figures 1 & 2. The purpose of this form is to correlate hazard severity to probability, in order to identify action and the level of management involvement

5.2 Hazard Severity Categories

CATEGORY I (CATASTROPHIC) - Personnel error, design deficiency, or malfunction which will result in loss of the aircraft, death or life threatening injuries.
CATEGORY II (CRITICAL) - Personnel error, design deficiency, or malfunction which will cause lost time injury to personnel and/or substantial damage to the aircraft.

CATEGORY III (MARGINAL) - Personnel error, design deficiency, or malfunction causing mission failure, loss of data, minor system failure or minor personnel injury.

CATEGORY IV (NEGLIGIBLE) - Personnel error, design deficiency, or malfunction may result in cost or schedule impact with no system damage or personnel injury.

Each Category I and II hazard that has the probability of occurring at sometime during the program (probability C) or more often (probability A or probability B) should be corrected or controlled by some means (such as redesign or incorporating redundancy or back-up capability, to the point where the event is unlikely (probability D) or improbable (probability E) to occur.

For piloted aircraft those items that are catastrophic or potential lost-time accidents that have an unlikely (but possible) probability of occurring are designated as Accepted Risks, if not corrected and must be presented to senior management in the form of an Accepted Risk List (see para. 6.4). At Dryden, risks with I-D and II-D classifications may be accepted by the AFSRB. Risks with classifications of I-A to I-C and II-A to II-C must be taken to the Center Director for acceptance. These actions should be the last resort after the project has exhausted ALL possible corrective and controlling actions.

For UAVs, risks which may result in loss of damage to the vehicle under Probability “C” may also be classified as accepted risks. In all other respects the rules given in the above paragraph apply to UAV projects as well as piloted aircraft projects. This is to recognize the vulnerability of the UAV, and the fact that its loss is more likely to occur than that of a piloted aircraft and that risk to an onboard crew is absent. It must be noted however, that death and critical injury of other personnel are treated the same as for piloted aircraft projects, in order to address the possibility of a wayward UAV crashing into buildings or other ground installations.

This Appendix was published to provide each project with a tool that will facilitate their implementation of the risk management process. Risk management is a project responsibility. Because of the business that we are in, most of the hazards that must be assessed for both criticality and probability will deal with one of a kind aircraft operating in projects where very few flight hours will be accrued. Also, the aircraft will receive the continuing attention of systems engineers not accorded to fleet aircraft. Because of this the data about components supplied by vendors or project contractors (both failure data and calculated reliability numbers), must be utilized with caution and the project must consider how that data must be modified to make it fit their project. The project MUST NOT simply take numbers given to them and plug them into the matrix to see where they fit. The thought process and sound judgment must be utilized in the implementation of the risk management responsibility.

6.0 HAZARD MANAGEMENT AND TRACKING:

6.1 Project

The Project Manager and Configuration Control Board (CCB) review all identified hazards. The CCB determines the criticality of each and assigns individuals or organizations to resolve them. The CCB reviews the resolutions and all supporting documentation and determines whether they are adequate.

The resolution of a hazard may require a change in configuration. If the configuration of a flight vehicle is changed to resolve a hazard, the configuration change process shall be performed.

6.2 Hazard Tracking

Hazards are documented and tracked using the Hazard Report form. The Aircraft Documentation Control Office has the capability to create Hazard Report files in each of the flight projects' databases. These files are used to track and report on the status of the identified hazards.

When a hazard has been resolved and the resolution as stated on the HR form, has been approved by the CCB, then the HR form is considered to be closed. Once a HR form is closed (see figure 3), it shall not be re-opened. If it is determined that the hazard has not been resolved, a new hazard report is issued.

6.3 Dryden Management Review

As part of the hazard management process, Dryden management must be aware of the hazards associated with any flight project. Prior to the first flight of a research vehicle, a Hazard Action Matrix chart and an Accepted Risk List must be prepared by the project and presented to both the FRR committee if there is one and the Airworthiness and Flight Safety Review Board (AFSRB). During the duration of the flight program the Accepted Risk List shall be presented at each subsequent Tech Brief.

6.4 Accepted Risk List

A suggested format for the Accepted Risk List is shown in Figure 2. The Accepted Risk List:

1) shall be presented at the AFSRB and every Tech Brief.

2) shall be signed by the Project Manager.

3) shall identify those hazards that have not been corrected but have been identified as accepted risks through proper analysis of the Hazard Action Matrix Note that discrepancies are not listed, but if a hazard is identified as a result of a Discrepancy Report, then that hazard, if not already addressed must be presented.

6.5 Hazard Closeout Presentation

All hazards that are identified Category I or II, probability (A) through (D) and closed-out between Tech Briefings must be presented to Dryden management along with the closing action, at the next Tech Brief.

Attachment 1

INSTRUCTIONS FOR PREPARATION OF THE HAZARD REPORT FORM

1.0 Purpose:

To describe the procedures for the preparation and processing of the Dryden Flight Research Center Hazard Report Form (See Figure 4).

2.0 Preparation:

2.1 HAZARD REPORT FORM

a)	PROJECT	Enter the name of the project with which the identified hazard is associated.
b)	ORIGINATOR /ORG	Enter the originator's name and the originator's organization.
c)	SITE	Enter name of site where hazard was identified or will apply.
d)	DATE	Enter the date when the hazard was identified.
e)	NO.	Enter the hazard number. The Configuration Control Office will assign this number.
g)	INFOSOURCE	Indicate how hazard was discovered or observed.
h)	CONTROL ROOM SIMULATION VEHICLE OTHERS	Identify facility for which the hazard was identified. If other than what is listed mark "others" and enter name of unit.
j)	A/C	Enter aircraft's name if hazard was identified on an aircraft.
k)	A/C S/N	Enter tail number of the aircraft for which the hazard was identified.
l)	CATEGORY/	Enter a combination of hazard severity

	PROBABILITY	and probability. Example: Category I, probability is "A", enter I-A.
m)	ASSIGNED TO	The CCB will assign a person to resolve the hazard. Enter the name of that person here.
n)	SYSTEM NAME	Enter the name of the system on which the hazard was discovered or observed.
p)	CI	Each project has a list of configuration item numbers which have been assigned to each of the project's systems. Enter the configuration item number of the system where the hazard was identified.
q)	RELATED DRS	When a discrepancy report is associated with the identified hazard, enter the discrepancy report number.
r)	HAZARD ANALYSIS OR SAFETY STUDY NAME	Enter a short title that summarizes or gives a general description of the hazard or the name of the study or hazard analysis report where the hazard is first identified.
s)	HAZARD DESCRIPTION	Enter a short narrative description of the hazard. Include environmental, operational or any other information which may be useful in resolving the hazard.
t)	HAZARD CAUSE	Enter the cause of the hazard
u)	HAZARD EFFECTS	Enter analysis and data summarizing the effect the hazard will have on the system if not resolved.
v)	RECOMMENDATION	Enter proposed action to resolve the hazard. If hazard cannot be resolved, list a proposed workaround action including assigning to the Accepted Risk List if necessary (see section 6.4).
w)	CLOSING ACTION	Enter all actions that were completed to resolve or workaround the hazard.

x) PROJECT MANAGER
PROJECT PILOT Authorized members of the Configuration Control Board (CCB) shall sign and date the HR form after review. Signatures of the Project Manager/Pilot constitutes approval of the closing action.

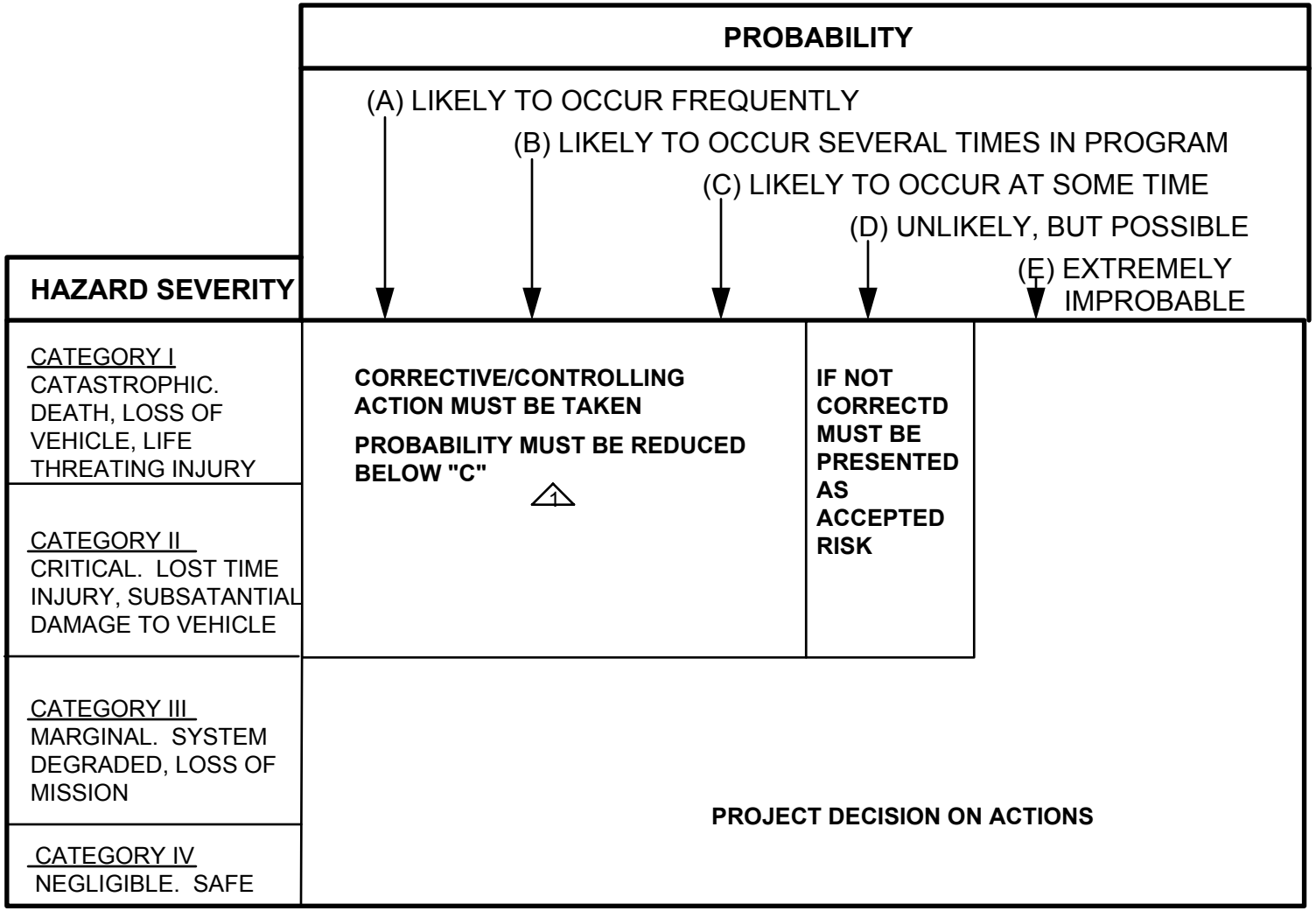

Figure 1

HAZARD ACTION MATRIX (ON-BOARD PILOTED AIRCRAFT)

1 Hazards resulting in UAV loss or damage, which occur under probability "C" are exceptions to the normal rule and may be classified as accepted risks

NASA National Aeronautics and Space Administration

Dryden Flight Research Center

ACCEPTED RISK LIST

AIRCRAFT: _____

HAZARD REPORT NO.	HAZARD	ASSOCIATED RISK

Project Manager _____ Date: _____

Figure 2

National Aeronautics and
Space Administration

Dryden Flight Research Center

HAZARD REPORT (HR)

PROJECT:	ORIGINATOR/ORG.:	TITLE:	SITE:	DATE:	HR NO.:

Information source:
- ☐ DESIGN REVIEW
- ☐ HAZARD ANALYSIS
- ☐ FIELD REPORT
- ☐ TEST
- ☐ DISCREPRANCY RPT.

Location:
- ☐ SAFETY STUDY
- ☐ VEHICLE
- ☐ CONTROL RM
- ☐ SIMULATION
- ☐ OTHER:

A/C FACILITY	A/C S/N:	CATEGORY/PROB.:	ASSIGNED TO:

SYSTEM NAME:	CI NO.: *(SYSTEM)*	

HAZARD ANALYSIS OR SAFETY STUDY NAME:

HAZARD DESCRIPTION AND JUSTIFICATION FOR CATEGORY / PROBILITY RATING:

SIG.: DATE:

CAUSE:

SIG.: DATE:

HAZARD EFFECTS:

SIG.: DATE:

CONTROL BOARD ACTION

- ☐ DESIGN REVIEW
- ☐ DESIGN REVIEW

RECOMMENDED ACTION:

PROJECT MANAGER: DATE:	PROJECT MANAGER: DATE:

HAZARD RISK REDUCTION ACTION

SIG:
DATE:

CLOSING ACTIONS

PROJECT MANAGER: DATE:	PROJECT PILOT: DATE:

HR FORM (1/96)

Figure 3