

## PUBLIC TECHNICAL DILIGENCE

# CrisisFlow Technical Methods Note

Decision objects, exposure inference, consequence construction, portfolio screening, reproducibility and validation boundaries.

**Purpose.** This note makes the public CrisisFlow method inspectable. It describes what the case computes, which states it preserves, how evidence enters the decision and what the demonstration does not establish.

**Scope.** The Hurricane Beryl and Port Houston case combines observed event and terminal-status evidence with an illustrative enterprise model and modeled consequences. No company or customer is identified.

## 1 Decision object model

**State discipline.** Every transition references the object that preceded it. Later knowledge can produce a new version, but it does not silently replace what the organization knew or authorized at the time.

| Object                | Minimum content                                                                   | Transition condition                                             |
|-----------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------|
| Prepared state        | Commitments, dependencies, buffers, alternatives, constraints and decision rights | Reviewed before disruption and versioned when conditions change  |
| Evidence              | Source, as-of time, version, authority, transformation, limitation and rights     | Accepted into the case with an explicit evidence class           |
| Exposure              | Typed path from event to enterprise object and commitment                         | Inference rule records direct, indirect or unresolved status     |
| Consequence           | Units, horizon, assumptions, scenario and formula version                         | Schema-checked inputs produce a deterministic scenario result    |
| Portfolio             | Action set, cost, timing, effects, checks and objective                           | All subsets are screened and an eligible result is ranked        |
| Proposal              | Specific portfolio plus evidence and calculation versions                         | Prepared for accountable review                                  |
| Authorization         | Decision owner, time, proposal version and status                                 | Accountable personnel approve, decline or revoke                 |
| Response and recovery | Authorized tasks, owners, deadlines, stabilization and recovery clocks            | Execution and recovery evidence append to the authorized version |
| Outcome and learning  | Observed results, overrides, exceptions and prepared-state updates                | Recorded without implying causation or rewriting history         |

## Event to enterprise trace

**Canonical path.** Event evidence connects to a hazard-specific exposure relationship, then to the operating network, product or service and business commitment. A case can stop at any unresolved edge; an absent relationship is never automatically interpreted as no exposure.

**PUBLIC RELEASE** BPH-1.2.0 | CF-ENUM-1.2.0 | BPH-MODEL-2026-09-15 | cd5d1d1e9d6c

**Claim boundary.** The case demonstrates traceability, deterministic behavior, constraint handling and versioned decision states. It does not establish predictive accuracy, causal action effectiveness, universal coverage, superiority or improved outcomes.

## 2 Exposure inference rules

| Disruption family         | Preferred evidence and match                                         | Declared degradation                                     |
|---------------------------|----------------------------------------------------------------------|----------------------------------------------------------|
| Natural and environmental | Official geometry, stable asset coordinates and polygon intersection | Administrative unit or disclosed distance rule           |
| Geopolitical and policy   | Named jurisdiction, entity, product, route and effective date        | Reviewed alias or ownership relationship                 |
| Market and stakeholder    | Counterparty, commitment and institutional context                   | Explicit proxy with applicability limits                 |
| Cyber and digital         | Technology, service dependency and business process                  | Reviewed dependency inference without claiming telemetry |

## Matching sequence

- Resolve the event object and temporal semantics.
- Resolve enterprise objects with stable identifiers before aliases or fuzzy matching.
- Apply the hazard-specific direct relationship first.
- Traverse supported enterprise dependencies without erasing evidence class.
- Preserve contradictory or missing relationships as unresolved.
- Attach the resulting path and its limitations to the decision version.

## Public Beryl case evidence classes

| Class                         | Example                                        | What it supports                                  |
|-------------------------------|------------------------------------------------|---------------------------------------------------|
| Observed event geometry       | NOAA NHC post-analysis best track              | The historical storm path                         |
| Observed operating status     | Port Houston weekly terminal-status report     | Public terminals closed 8 and 9 July 2024         |
| Illustrative enterprise model | Supplier, route, plant, product and commitment | An inspectable demonstration path only            |
| Hypothetical scenario         | Five-day closure duration                      | A bounded planning input, not historical duration |

### 3 Consequence construction

**Scenario model.** The public case measures missed priority and standard units over a ten-day horizon. It combines declared demand, prepared buffer, disruption duration, recovery and the physical effects of the selected action set.

$$\text{Missed units} = \max(0, \text{cumulative demand} - \text{cumulative available supply})$$

$$\text{Objective}(P) = 3 \times \text{priority missed units}(P) + \text{standard missed units}(P)$$

$$\text{Order value outside horizon}(P) = \text{missed systems}(P) \times \$80,000$$

**Interpretation.** The coefficient 3 is a declared preference for priority demand in this case model. It is not an estimated probability, fitted parameter or general customer value. The \$80,000 per-system order value translates operating units into an inspectable economic scale; it is not loss, value at risk, revenue forecast or causal benefit.

### Range and sensitivity discipline

| Display                     | Calculation                                                               | Interpretation                                              |
|-----------------------------|---------------------------------------------------------------------------|-------------------------------------------------------------|
| Low, base and high          | Change only the hypothetical closure duration for the displayed portfolio | Bounded scenarios; not percentiles or confidence intervals  |
| Decision-switch sensitivity | Recalculate the best eligible portfolio at each whole-day duration        | The first lower or higher input at which the choice changes |
| No feasible portfolio       | Return a distinct state rather than the no-action portfolio               | Constraints prevent every portfolio in the displayed set    |

### Validation inputs

- Numeric inputs must be finite and inside disclosed bounds.
- Every required authority key must be present as an owned property with an allowed state.
- Unknown, null or inherited authority values do not silently pass.
- Scenario cards become unavailable when no eligible current portfolio exists.

## 4 Portfolio formulation

**Bounded exact search.** Five binary actions create 32 complete subsets. The browser enumerates every subset; no external solver, model call or precomputed lookup table selects the result.

| Element            | Public-case formulation                                                                               |
|--------------------|-------------------------------------------------------------------------------------------------------|
| Decision variables | A, B, C, D and E are binary selections                                                                |
| Objective          | Minimize 3 x priority missed units plus standard missed units                                         |
| Hard screens       | Budget, action window, capacity, qualification, contract, prerequisite, incompatibility and authority |
| Conditional state  | An otherwise admissible portfolio contains an unresolved prerequisite or authority                    |
| Tie-breakers       | Objective, then cost, then time to first effect, then portfolio key                                   |
| Solution status    | Exact only within the displayed five-action set and its declared assumptions                          |

## Why excluded actions remain visible

**Constraint audit.** A rejected portfolio is evidence about the decision boundary. CrisisFlow therefore shows why it failed instead of removing it from the comparison. This makes budget, timing, capacity, prerequisite, incompatibility and authority conditions reviewable by an operator.

## Reproducibility controls

- Case version BPH-1.2.0 identifies the displayed case package.
- Input manifest BPH-MODEL-2026-09-15 identifies the illustrative fixture and historical disclosures.
- Formula version CF-ENUM-1.2.0 identifies the tested calculation and authority checks.
- Release hash cd5d1d1e9d6c identifies the published input manifest checksum.
- Unchanged schema-checked inputs produce unchanged results; tie-breakers are deterministic.

## 5 Governance and open validation

**Human authority.** The engine can classify and rank a portfolio. It cannot establish that the live operating environment still satisfies every assumption. Accountable customer personnel confirm executability and authorize consequential action.

### Validation register

| Open question          | Evidence needed before a stronger claim                                                                      |
|------------------------|--------------------------------------------------------------------------------------------------------------|
| Consequence accuracy   | Backtesting and prospective comparison against observed operating data                                       |
| Action-effect validity | Customer and operator validation by action, context and time horizon                                         |
| Exposure coverage      | Known-edge audits, licensed or customer network data and unresolved-edge rates                               |
| Decision improvement   | Predefined comparators, decision-quality measures and governance-approved evaluation                         |
| Cross-case transfer    | Separate reuse rights, sufficient observations, de-identification review and evidence that patterns transfer |

### Decision history

- A proposal snapshot retains its inputs, result and formula version.
- Authorization and revocation append events; they do not delete the original event.
- Execution and outcome remain empty until supported by evidence.
- The public case history is session-local and clears on reload; it is a behavior demonstration, not a production record.

### Method claim boundary

**Restraint is part of the method.** The design is research-informed and technically explicit. The public evidence does not yet support claims of calibrated prediction, causal intervention effectiveness, bias correction, universal coverage, comparative superiority or customer outcome improvement.

## 6 Evidence behind the public context

**Why these statistics appear on the site.** The homepage uses three compact context measures to establish the decision problem. They are not CrisisFlow performance claims. The source design and limitations are stated here so the marketing page can remain legible without hiding how the figures were produced.

| Public measure                                                                                                                         | Source design                                                                                                                                                                                                                                                          | Interpretation and limitation                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Almost 45% of one year's profits over a decade                                                                                         | McKinsey Global Institute modeled representative companies in 13 industries using data from the 25 largest public companies in each and estimated disruption frequency and financial effect                                                                            | A modeled cross-industry average, not a forecast for a specific company                                                                                              |
| An international firm is 25× more likely to be affected by a major geopolitical shock than the average international firm 25 years ago | Ballesteros (2026) links firm-level international co-invention relationships in USPTO records to abrupt bilateral-tension shocks. The study includes 6,645 firms, 25,841 firm-by-affected-pair events and 593 affected country pairs; treatment cohorts span 2003-2019 | A historical comparison for the study's analytic population, not a forecast for a particular firm, a loss estimate or evidence that every firm has the same exposure |
| 82% risk / 25% very prepared                                                                                                           | DP World and Supply Chain Dive studioID surveyed 152 North American senior professionals in operations, supply chain, and IT                                                                                                                                           | Perceptions in a sponsored 2025 survey; the risk question and preparedness question address related but different concepts                                           |

### Complete source references

- Lund, Susan, James Manyika, Jonathan Woetzel, Edward Barriball, Mekala Krishnan, Knut Alicke, Michael Birshan, Katy George, Sven Smit, Daniel Swan, and Kyle Hutzler. 2020. 'Risk, Resilience, and Rebalancing in Global Value Chains.' McKinsey Global Institute, August 6.  
<https://www.mckinsey.com/capabilities/operations/our-insights/risk-resilience-and-rebalancing-in-global-value-chains>.
- DP World. 2025. 'DP World Study Finds Supply Chains Underprepared for Geopolitical Risks.' November 4. Survey conducted with Supply Chain Dive's studioID. <https://www.dpworld.com/en/news/usa/dpw-study-finds-supply-chains-underprepared-for-geopolitical-risks>.
- National Hurricane Center. 2025. 'Hurricane Beryl AL022024 Best Track.' Post-analysis best-track archive, source file dated January 23. [https://www.nhc.noaa.gov/gis/archive\\_besttrack\\_results.php?id=al02&name=Hurricane+BERYL&year=2024](https://www.nhc.noaa.gov/gis/archive_besttrack_results.php?id=al02&name=Hurricane+BERYL&year=2024).
- Port Houston. 2024. 'Weekly Terminal Status Report.' July 15.  
<https://porthouston.com/wp-content/uploads/2024/07/Terminal-Status-Report-07.15.24.pdf>.
- Natural Earth. 'Admin 1 States and Provinces, 1:10m Cultural Vectors.' Accessed September 14, 2026.  
<https://www.naturalearthdata.com/>.

## 7 Selected research foundations

**How research enters the platform.** The selected work informs the decision structure: uncertainty without false precision, heterogeneity in exposure and response, organizational constraints, locus of authority and learning after rare disruptions. These references support a method lineage; they are not validation of CrisisFlow product performance.

**CITATION REVIEW** Reviewed 16 September 2026 | Relevance statements governed as method claims

### 1. Geopolitical adjustment inside continuing relationships

Ballesteros, Luis. 2026. 'Geopolitical Tensions and the Recomposition of International Invention.' Working paper, Boston University, version August 26, 2026.

*Supports resolving geopolitical exposure through the relevant bilateral relationship, technology and third-country network rather than inferring that an unchanged aggregate relationship means no consequential adjustment.*

### 2. Uncertainty and the full cycle

Ballesteros, Luis, and Howard Kunreuther. 2026. "Beyond Riskification: A Formal Model of Organizational Decision Making and Resilience Under Uncertainty Shocks." Working paper. Earlier version released as NBER Working Paper 24924 (2018), "Organizational Decision Making Under Uncertainty Shocks." <https://doi.org/10.3386/w24924>.

*Informs the decision-centered treatment of preparation, response, recovery and learning under uncertainty that cannot be reduced to a stable probability distribution.*

### 3. Institutional disruption and heterogeneous response

Ballesteros, Luis, and Catherine Magelssen. 2022. "Institutional Disruptions and the Philanthropy of Multinational Firms." Organization Science 33 (4): 1501–1522. <https://doi.org/10.1287/orsc.2021.1491>.

*Supports preserving firm, country and event context rather than treating disruption response as homogeneous.*

### 4. Context-dependent action value

Ballesteros, Luis, and Aline Gatignon. 2019. "The Relative Value of Firm and Nonprofit Experience: Tackling Large-Scale Social Issues Across Institutional Contexts." Strategic Management Journal 40 (4): 631–657. <https://doi.org/10.1002/smj.2968>.

*Reinforces that an action's usefulness depends on institutional and operating context, motivating explicit prerequisites and constraint screens.*

### 5. Experience, operating capability and recovery

Ballesteros, Luis, Michael Useem, and Tyler Wry. 2017. "Masters of Disasters? An Empirical Analysis of How Societies Benefit from Corporate Disaster Aid." Academy of Management Journal 60 (5): 1682–1708. <https://doi.org/10.5465/amj.2015.0765>.

*Informs the separation between action, organizational capability and observed recovery rather than assuming that expenditure alone determines results.*

### 6. Information processing and locus of authority

Magelssen, Catherine, Luis Ballesteros, and Casidhe Troyer. 2026. "Connectivity Infrastructure and Innovation: The Effects of Headquarters versus Subsidiary Management." Research Policy 55 (8): 105542. <https://doi.org/10.1016/j.respol.2026.105542>.

*Supports treating reporting structure and the locus of managerial authority as part of how organizations process information and act.*