

## Digital Twins and Rethinking Good Weather in Speed and Consumption Warranties

*This article examines the ‘good weather’ paradigm in speed and consumption warranties under English time charter law. It assesses if digital twins, through continuous performance modelling in varied conditions, support an ‘all weather’ method. The conclusion stresses that any shift requires precise contractual terms, not just technological advances.*

### 1. Introduction

Speed and consumption warranties remain central to the allocation of operational risk under time charters. Their interpretation has long depended on the concept of “good weather”, not as an abstract meteorological standard, but as an evidential filter through which vessel capability is inferred. Where environmental interference is minimal, observed performance is treated as representative of what the vessel can achieve in ordinary service, an approach embedded in English law since *The Didymi*<sup>1</sup> and reflected in standard charterparty drafting.<sup>2</sup>

This paradigm has proven durable because it is often argued to provide a workable compromise between contractual certainty and evidential feasibility. It claims legal sufficiency rather than scientific precision and performance is assessed through selective sampling, not continuous measurement. Courts have consistently resisted importing technical correction mechanisms into performance warranties where the charterparty does not do so expressly. Digital twin technology introduces some nuance to this paradigm. By purporting to model how a specific vessel should perform across varying conditions, digital twins may challenge the assumption that performance must be inferred indirectly through good weather periods. If performance can be normalised rather than filtered, the justification for excluding large portions of the voyage weakens theoretically.

This article examines whether digital twins justify a rethinking of the good weather paradigm in speed and consumption claims under English law. It does not argue that digital twins should displace good weather analysis by default. Rather, it asks whether they make possible a different contractual approach to performance assessment, and what the limits of that approach are when viewed through the lens of traditional time charter doctrine.

### 2. The orthodox logic of good weather claims

Good weather clauses emerged as a response to evidential difficulty rather than legal theory. Time charter warranties typically promise a certain speed and consumption, but ships trade through variable seas. The law therefore permits performance to be judged by reference to periods where environmental interference is minimal. Those periods are treated as revealing what the vessel is capable of achieving when external factors do not mask deficiencies, forming the basis for extrapolation across the voyage as accepted in *The Didymi*<sup>3</sup> and reaffirmed in later authorities such as *The Gas Enterprise*<sup>4</sup>.

This logic has three defining features.

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<sup>1</sup> *Didymi Corporation v Atlantic Lines and Navigation Company Inc* (1987) EWCA Civ J1023-2.

<sup>2</sup> For example, Cl 12 of NYPE 2015.

<sup>3</sup> *Supra* (n1).

<sup>4</sup> *Exmar NV v. BP Shipping Ltd. (The “Gas Enterprise”)* [1993] 2 Lloyd's Rep 352.

First, good weather operates as a filter, not a correction. Periods falling outside the contractual definition are excluded entirely, rather than adjusted mathematically. This distinction is critical because where a clause requires “no adverse currents”, that phrase typically functions to disqualify periods influenced by current, not to invite adjustment for favourable current. The point was made explicitly in *The Divinegate*<sup>5</sup>, where the Court rejected the argument that positive currents should be deducted in the absence of clear wording to that effect.

Secondly, good weather analysis is explicitly inferential. It does not claim to measure actual performance throughout the voyage. It infers capability from selected conditions and extrapolates. That extrapolation is accepted because the alternative, attempting to correct every hour of performance for every variable, was historically seen as impractical and inconsistent with how performance warranties are framed in standard forms such as NYPE, which continue to rely on good weather qualifiers rather than performance models.

Thirdly, the method is clause-centred. The definition of good weather is a matter of construction. Absent express wording, tribunals do not import technical correction methodologies by implication. This is illustrated by decisions rejecting rigid practice assumptions, such as mandatory continuous twenty-four-hour qualifying periods, where the charter does not require them, most notably in *The Ocean Virgo*.<sup>6</sup> These features explain why good weather claims remain dominant even as navigational and performance data have proliferated. The method fits the legal and commercial architecture of time charters. Any alternative must do the same.

### **3. What digital twins actually change**

A digital twin, in the maritime context, is a vessel-specific performance model calibrated using historical operational data and environmental inputs. Its defining claim is not simply that it records what happened, but that it estimates what the vessel should have achieved under the conditions encountered. In doing so, it could separate intrinsic performance from environmental influence. If that claim holds, the justification for restricting performance assessment to good weather periods weakens. Instead of filtering out complexity, the model attempts to absorb it. Performance can be evaluated across all encountered conditions by comparing actual results with modelled expectations.

However, it is important to be precise about what changes and what does not: Digital twins do not remove uncertainty, as they reallocate it instead. Instead of arguing over whether a sea state qualifies as Douglas 3 or 4, parties may argue over the calibration of resistance coefficients, the reliability of hindcast weather data, or the treatment of partial currents. The point of contest shifts from classification to modelling. More importantly, digital twins alter the evidential posture of performance claims. Under good weather analysis, the claimant must identify qualifying periods and demonstrate underperformance within them. Under a model-based approach, underperformance is potentially defined by deviation from a calculated baseline. That baseline is not observed fact, but a constructed expectation.

This is not inherently problematic, but it has contractual consequences. A model is not neutral unless the contract makes it so.

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<sup>5</sup> *Eastern Pacific Chartering Inc v Pola Maritime Ltd (“The Divinegate”)* [2022] EWHC 2095 (Comm).

<sup>6</sup> *Polaris Shipping Co. Ltd v Sinoriches Enterprises Co. Ltd (Ocean Virgo)* [2015] EWHC 3405 (Comm.)

#### **4. The conceptual viability of an “all weather” clause**

English law places few constraints on how parties define performance obligations. There is no doctrinal barrier to a clause that measures speed and consumption by reference to a continuous modelled baseline rather than sampled conditions. The question is whether such a clause can be drafted with sufficient certainty and internal coherence, bearing in mind the interpretative instincts displayed in performance cases. An all weather clause must address, expressly and deliberately, the issues that good weather clauses resolve implicitly.

The first is the treatment of environmental variables. Under the orthodox approach, adverse weather excludes periods from assessment. Under an all weather approach, weather becomes a corrective input. That shift must be explicit. If currents, waves, or wind are to be corrected for rather than filtered out, the clause must say so. Otherwise, the traditional interpretative instinct illustrated in *The Divinegate*<sup>7</sup> will reassert itself, and the clause will be read as exclusionary rather than corrective.

The second is the definition of the baseline. What does “expected performance” mean? Is it the warranted speed “about” a stated figure in good weather, as typically expressed in NYPE rider clauses, or a different benchmark derived from historical data or sea trials. Without a defined reference point, the clause risks collapsing into argument about what the vessel was capable of in the first place, a question which performance warranties are designed to stabilise.

The third is symmetry. Good weather clauses are symmetrical in a simple way. If the weather is bad, neither party can rely on those periods. An all weather clause must decide whether favourable conditions benefit the owner, the charterer, or neither. If currents are corrected out in adverse conditions but left in when favourable, the clause embeds an asymmetry that may not reflect the commercial bargain, and which courts are unlikely to infer without clear words.

These are not technological questions. They are questions of contractual allocation.

#### **5. Reframing performance assessment under an all weather clause**

If digital twins are to underpin an all weather clause, the clause must be understood as redefining what counts as performance evidence. Under the traditional model, evidence is observational. Noon reports, engine logs, and weather records are used to reconstruct what happened during selected periods. Under an all weather model, evidence becomes comparative. Actual performance is assessed against a constructed expectation derived from the model.

This reframing has two consequences. First, performance is no longer tied to discrete qualifying periods. The concept of “representative hours” recedes, a concept which case law has already treated with relative flexibility. Performance becomes a continuous assessment, potentially smoothing out anomalies that would otherwise dominate a claim built on limited data windows.

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<sup>7</sup> Supra (n5)

Secondly, the role of data hierarchy becomes central. If performance is assessed across all conditions, the question of which datasets are authoritative becomes unavoidable. Speed through water versus speed over ground, sensor-derived data versus manual logs, forecast versus hindcast weather, and the treatment of currents all could affect the output of the model. An all weather clause must therefore do what good weather clauses historically avoided. It must specify which data matter and how they interact.

## **6. The risk of overreach**

There is a temptation to view digital twins as a way to eliminate subjectivity from performance claims. That temptation should be resisted because models embed assumptions. They privilege certain variables and smooth others. If the contract does not control those assumptions, the clause risks becoming indeterminate.

There is also a risk of normative drift. Good weather clauses operate within a well-understood evidential tradition. An all weather clause that relies on modelling may, in practice, redefine what counts as acceptable performance without the parties fully appreciating the consequences. A vessel that meets her warranted capability but diverges from a model calibrated on idealised conditions may appear deficient, even though she would pass a traditional good weather assessment. This does not mean that digital twins are unsuitable. It means that they shift the performance inquiry from observation to interpretation. That shift must be priced into the contract.

## **7. Conclusion**

The persistence of good weather analysis in speed and consumption claims is not accidental. It reflects a settled evidential logic that aligns with how time charters allocate risk and responsibility, as recognised in the case law from *The Didymi* through to *The Divinegate*. Good weather clauses operate as filters, not corrections. They avoid the need to quantify every variable by excluding conditions that obscure performance rather than attempting to neutralise them. Digital twins challenge that logic by offering a model-based alternative. They propose that performance can be assessed continuously, across all conditions, by reference to a constructed baseline rather than inferred capability. That proposal is not inconsistent with English law, but it is not neutral either. It redefines what counts as performance evidence and relocates uncertainty from observation to modelling.

The consequence is that digital twins do not undermine good weather claims as a matter of doctrine, rather, they expose the contingent nature of the good weather paradigm. That paradigm emerged because continuous correction was impractical and contractually undefined. Where parties now choose to define it, an all weather approach becomes contractually viable. The limit lies in drafting, not technology. Unless a charter squarely addresses the baseline, the treatment of environmental variables, and the evidential status of modelled expectations, the traditional good weather logic will reassert itself. Digital twins therefore expand the menu of contractual choice, but they do not rewrite the law. They permit performance to be assessed differently, provided the contract acknowledges the consequences of doing so.