



# The future of insurance for connected drone fleets

An exposure-based approach to real-time risk management in a connected and autonomous world

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## Executive summary

The rapid emergence of connected and autonomous drones brings with it a range of unprecedented opportunities, both economically and for social good. However, this novel technology has also given rise to a broad range of new and complex risks, which drone operators sometimes struggle to understand, and which insurers struggle to price.

The application of traditional insurance pricing methods in the drone industry has led to many drone operators and enterprises paying substantially more for their insurance than their risk actually requires. This opaque 'one-size-fits-all' approach means that proactive risk mitigation is not incentivised or rewarded by insurers, despite the likelihood of fewer claims.

Thankfully, the rise of flying robots has coincided with the rise of Big Data. When used intelligently, Big Data can be harnessed to quantify, intelligently price, and mitigate drone flight risks in real-time. As such, insurance is more transparent, with fairer pricing tailored to individual risk profiles. What's more, rich data insights can enable drone operators to fly safer, and be rewarded for doing so.

This new alternative to traditional insurance is known as an 'exposure-based' approach. This white paper will detail this innovative approach, with the case studies serving to illustrate how the benefits of 'exposure-based' insurance are already being realised by drone operators throughout the industry, from SMEs all the way up to world-leading drone enterprises.

## The changing face of insurance

In 2017, The Economist proclaimed that data has overtaken oil as the world's most valuable resource—with good reason<sup>1</sup>. Data is being generated at an exponential rate, with reports that in 2018 humans created 2.5 billion gigabytes per day - with 90 per cent of the world's data produced in the last two years alone<sup>2</sup>. Gathering and analysing big datasets has enabled businesses in various markets to draw powerful insights and launch smarter products to better serve their customers.

Big Data has immense implications for the future of the global \$4 trillion insurance industry<sup>3</sup>. However, despite the explosion of data from connected devices, application of this data by insurers for individualised risk models is still largely in its infancy.

For enterprises seeking more tailored insurance solutions based on their unique risk profile, there is good news on the horizon. According to McKinsey, by 2030 the insurance market will evolve to contain highly dynamic, usage-based insurance products that are tailored to customer behaviour<sup>4</sup>. McKinsey predicts that insurance will transition from an annual renewal model to a continuous cycle, with products that constantly adapt to individual behavioural patterns.

The future of the insurance industry does not stop at usage-based products but rather broadens into predictive risk mitigation. As model sophistication evolves with the realisation of Big Data, insurers will have the ability to provide transparent steps to mitigating risk and avoiding claim events<sup>5</sup>. Such a shift in the relationship between insurer and customer aligns with the social trends PwC uncovered in their 'Insurance 2020' report<sup>6</sup>.

In some markets, dynamic and tailored insurance solutions already exist. This white paper demonstrates how both personalised insurance and data-driven risk mitigation is being delivered at scale in the rapidly growing drone industry. We will highlight the core limitations of traditional insurance pricing methods, and discuss how Flock's pioneering approach to drone insurance — exposure-based pricing — is transforming how enterprises insure large connected drone fleets. We will conclude by laying out our vision for the future of connected fleet insurance.

## Spotlight on the drone industry

The emerging drone industry is undergoing rapid expansion. Goldman Sachs forecast that drones will present a \$100 billion market globally by 2020, with the majority of growth occurring in commercial activity<sup>7</sup>. This, in turn, will fuel the growth of the drone insurance market, due in part to the regulatory requirement for commercial operators to have compliant insurance policies in place<sup>8</sup>.

Whilst the growth trajectory is steep, the industry is still relatively nascent. As such, the amount of historical data that insurers have to work with is relatively low. This lack of data presents a number of obstacles for insurers to intelligently or fairly price drone insurance for customers, calling into question whether traditional pricing methods are suitable for the drone industry.

<sup>1</sup> The Economist (2017). "The world's most valuable resource is no longer oil, but data", <https://econ.st/2Gtfztg> (Accessed: 07/03/2019).

<sup>2</sup> Forbes (2018). "Big Data Analytics Adoption Soared in the Enterprise in 2018", <https://bit.ly/2PaIU1H> (Accessed: 19/02/19).

<sup>3</sup> Insurance Journal (2018). "Global Insurance Premiums Rise by 1.5% in 2017, Driven by Emerging Markets: Swiss Re", <https://bit.ly/2LbvBLm> (Accessed: 20/05/2019).

<sup>4</sup> McKinsey & Company (2017). "Insurtech-the threat that inspires", <https://mck.co/2h9yGC1> (Accessed: 27/02/2019)

<sup>5</sup> Raconteur (2018). "Insurance moves from reactive to predictive", <https://bit.ly/2WIy466> (Accessed: 08/05/2019).

<sup>6</sup> PwC (2012). "Insurance 2020: Turning change into opportunity", <https://pwc.to/2JfQgkh> (Accessed: 09/05/2019).

<sup>7</sup> Goldman Sachs (2016). "Drones: Reporting for Work", <https://bit.ly/2PMcJpg> (Accessed: 14/02/19).

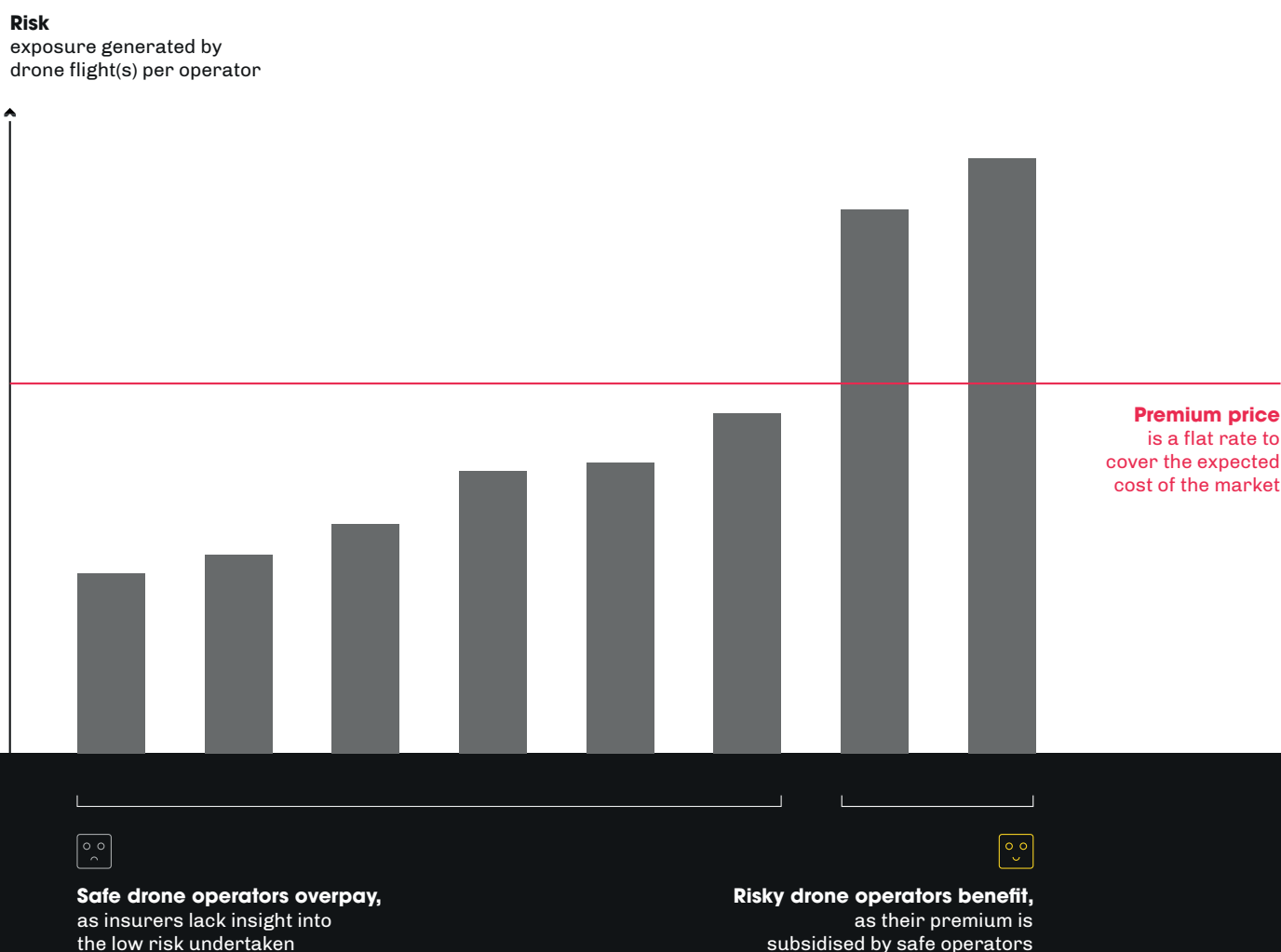
<sup>8</sup> Civil Aviation Authority (2004). "Aircraft Insurance" <https://bit.ly/2ZgDvLh> (Accessed: 15/04/19).

## Traditional insurance pricing: the experience-based approach

Traditionally, insurance premiums have been calculated by using historical claims and policy data<sup>9</sup> to indicate the level of risk associated with a certain industry, and to forecast the likelihood of future claims. Underwriting in this way works with a high degree of reliability in well-established markets where many years' worth of data is available. However, in new or emerging industries (drones, for example) that have little claims or policy data, adequately pricing risk using this method presents a challenge for insurers<sup>10</sup>.

Aside from providing insurance cover, insurance companies operating in the drone space do not currently provide a significant amount of 'value added' services for their customers. Whilst insurers in other sectors now leverage their own expertise to provide a range of additional benefits (such as health management apps, or safety tools<sup>11</sup>), insurers in the drone industry are yet to take note. As such, it is left up to drone pilots themselves to source and assess their own risk mitigation tools.

**Figure 1:** Experience-based insurance pricing may result in safe operators overpaying on premiums



<sup>9</sup> Chartered Insurance Institute (2016). "Basic Concepts and Techniques of the Pricing Process". <https://bit.ly/2Xez6Hq> (Accessed: 19/02/19).

<sup>10</sup> Deloitte (2019). "2019 Insurance Outlook". <https://bit.ly/2GC01GC> (Accessed: 18/02/19).

<sup>11</sup> CapGemini (2017). "Insurance Reinvented: Value-Added Services". <https://bit.ly/2JvYfda> (Accessed: 15/04/19)

## Why traditional insurance pricing is unfit for the drone industry

Traditional pricing methods face three obstacles when applied to the drone insurance industry, deeming them unfit for purpose:

### 1 A lack of historical claims data leads to over-pricing.

A lack of claims data in the drone industry (due to its infancy) makes it difficult for insurers to confidently forecast future losses, and therefore to accurately calculate premium prices. This leads to conservative pricing on policies, resulting in many drone operators and enterprises paying substantially more for insurance than their risk actually requires.

### 2 A 'broad-brush' approach to insurance pricing oversimplifies a diverse industry.

No two drone pilots or flights are the same, and neither are their risk profiles. In fact, Flock's Risk Intelligence Engine has shown that flight risk profiles can vary by over 10,000 per cent through changes in pilot experience and flight location (see on page 8 for more detail on Flock's Risk Intelligence Engine). The 'one-size-fits-all' approach to pricing that many traditional insurers have adopted results in limited or zero visibility into customer activity. A lack of consideration by insurers of the risks taken at an individual customer level may result in safety conscious drone enterprises overpaying for their insurance.

### 3 Risk mitigation is neither incentivised nor enabled by insurers.

There is currently a lack of transparency from insurers into how they correlate operational risk and premium price. Without this insight, drone operators and enterprises pursuing best practice and taking active steps to reduce their own risks (such as planning flights to avoid high-risk locations or adverse weather conditions) are not rewarded, despite the likelihood that they will have fewer claims as a result. In the same vein, insurers in the drone space currently lack the technical (and technological) capabilities to actively provide their customers with real-time risk mitigation technologies.

Traditional insurance has become a burden in the dynamic drone industry; over-priced, inflexible, and opaque. An alternative approach to assessing and pricing drone insurance is now required. By leveraging Big Data to intelligently identify and quantify flight risks, it is now possible to provide tailor-made policies based on individual risk profiles. The result is highly personalised, transparent insurance pricing, and the ability for insurers to reward drone enterprises for proactive risk mitigation.

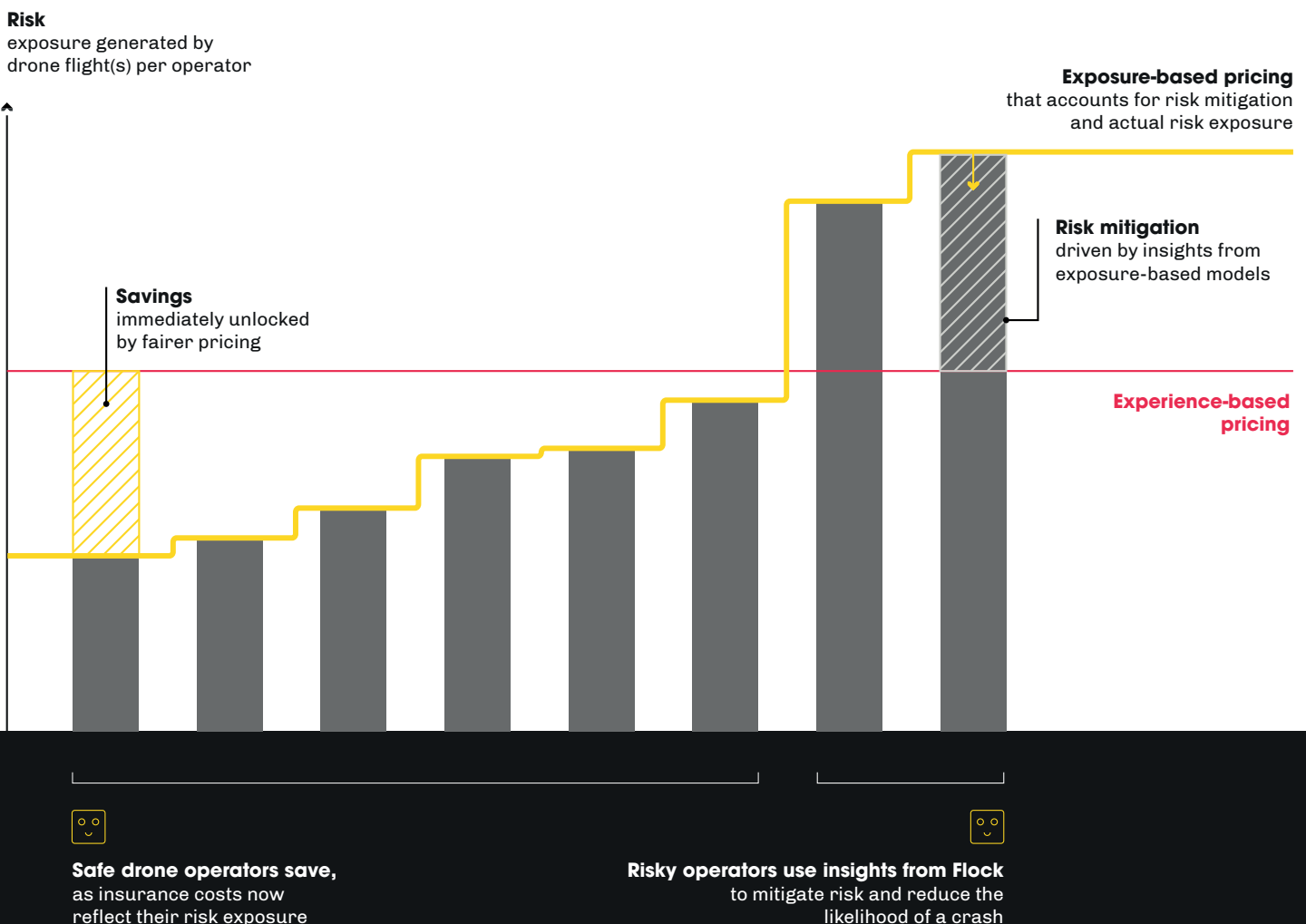
## The future of drone insurance: an exposure-based approach to risk management

In contrast to traditional insurance pricing, 'exposure-based' pricing considers risk on a per-event (or in this case, on a per-flight) basis. By combining real-time data with algorithmic risk assessments, it is possible to predict the likelihood ('probability') of a drone flight resulting in a crash, as well as the associated cost ('severity') of that crash. Multiplying the probability of a crash with its associated severity gives the 'technical insurance price' (or expected loss) of a single drone flight.

This allows for an unparalleled degree of precision when assessing and pricing drone flight risks. Rather than treating all drone enterprises in the same way and providing them with an annual policy price, an exposure-based pricing approach allows for the risk of each and every flight undertaken by a drone fleet to be quantified and priced individually. The result is a more accurate correlation between risk and price, as demonstrated in Figure 2.

As well as more accurate pricing, an insurer with visibility into a drone pilot's real-time exposure is able to provide actionable insights at the precise moment they are required, for example by encouraging them not to fly in the wind or rain. Insurers are then able to offer more comprehensive 'risk management' solutions, rather than just insurance policies.

**Figure 2:** Exposure-based insurance pricing aligns cost with risk for fairer pricing





## Case study: Flock Cover, app-based 'Pay-as-you-fly' drone insurance

In January 2018, Flock launched Europe's first 'pay-as-you-fly' drone insurance solution with leading aviation insurer Allianz. Through a simple mobile app, commercial and recreational pilots could, for the first time, purchase customised equipment and liability insurance on demand (lasting from one to eight hours).

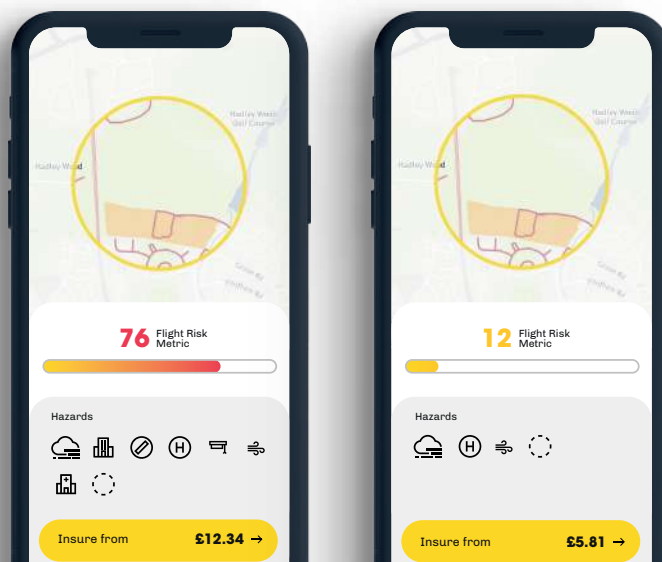
This Pay-as-you-fly product marked a dramatic departure from traditional insurance, using advanced data-driven analytics to quantify, mitigate, and insure drone flight risk in real time via Flock's proprietary Risk Intelligence Engine.

Since launch, Flock's Risk Intelligence Engine has analysed and priced risk for more than 500,000 Pay-as-you-fly drone flights. By clearly visualising these risks in the Flock Cover app's in-built Flight Planning Tool, thousands of drone pilots have been empowered to proactively optimise towards lower-risk flights.

Our analysis shows that on average, Pay-as-you-fly pilots will compare 15 different risk-dependent quotes before purchasing a policy (such as by changing the date and time of flight, or altering the flight plan). By comparing Flight Risk Metrics, pilots can identify when and where it is safest to fly. This has resulted in a 4.5 point reduction of the Flight Risk Metric per flight flown, which has helped pilots lower their final quote price by 15%.

**Figure 3:** Pro-active flight risk mitigation via the Flight Planning Tool

**Before**  
flight risk has  
been optimised



**After**  
flight risk has  
been optimised

*"Flock are utilising geospatial data in a truly pioneering way to significantly enhance traditional risk assessment, and most importantly deliver superior customer outcomes. This aligns with Allianz's ambition to utilise and source the best possible location data to deliver technical excellence for our customers. Allianz look forward to further collaboration and engagement with Flock in pursuit of our shared objectives"*

Chris Wyard  
Head of Underwriting Data, Allianz



## Benefits of exposure-based drone insurance

A transition towards exposure-based insurance offers a range of benefits for large drone enterprises:

### 1 Alignment of insurance cost and revenues.

With additional information and insights into their own exposures, drone enterprises can take measures to reduce their own risks down to an individual flight level. Flock's Pay-as-you-fly mobile app, for example, has now alerted thousands of its insured pilots to nearby ground hazards (such as schools and hospitals) and real-time risks (such as encroaching adverse weather conditions), thereby actively helping them to mitigate their own risks.

### 2 Risk mitigation is rewarded.

Insurance premiums can be directly aligned with actual risks undertaken by each individual drone enterprise. Therefore enterprises that take proactive steps to mitigate their flight risks are rewarded with lower premium prices. For example, drone pilots choosing to delay takeoff until weather conditions are more favourable can see their per-flight premiums dramatically reduced as a result.

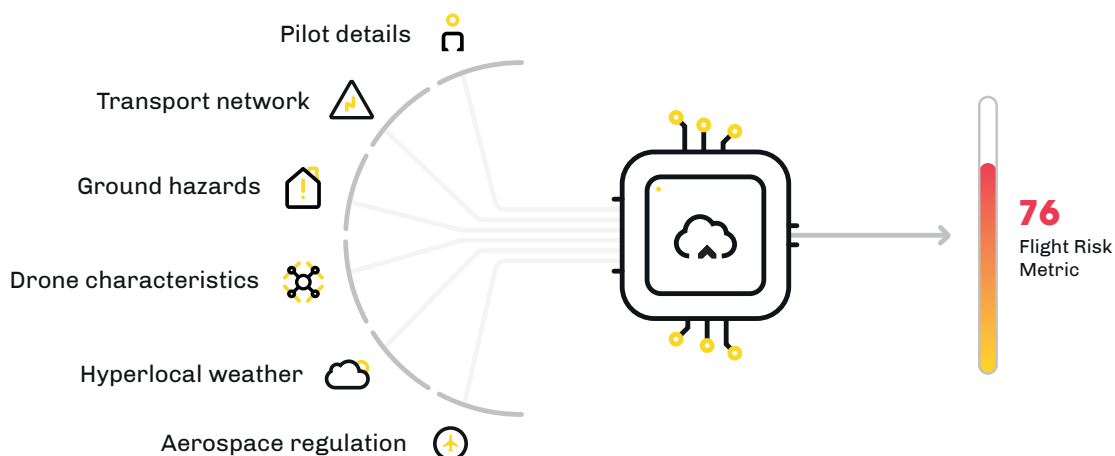
### 3 Revenues and insurance costs are aligned.

With an exposure-based insurance policy, flying more frequently (and thereby undertaking a greater degree of in-flight risk) can result in a higher premium price. In quieter periods, however, enterprises are less exposed to in-flight risk, paying lower premiums as a result. This reduces the complexity of financial planning and stabilises an organisation's cash flow.

## Flock's Risk Intelligence Engine

Flock's product suite is powered by a proprietary Risk Intelligence Engine. This engine aggregates large, unstructured datasets data from over 25 third-party and proprietary sources, and assesses them algorithmically to produce a quantified output of risk for any drone flight.

Figure 4: Flock Risk Intelligence Engine

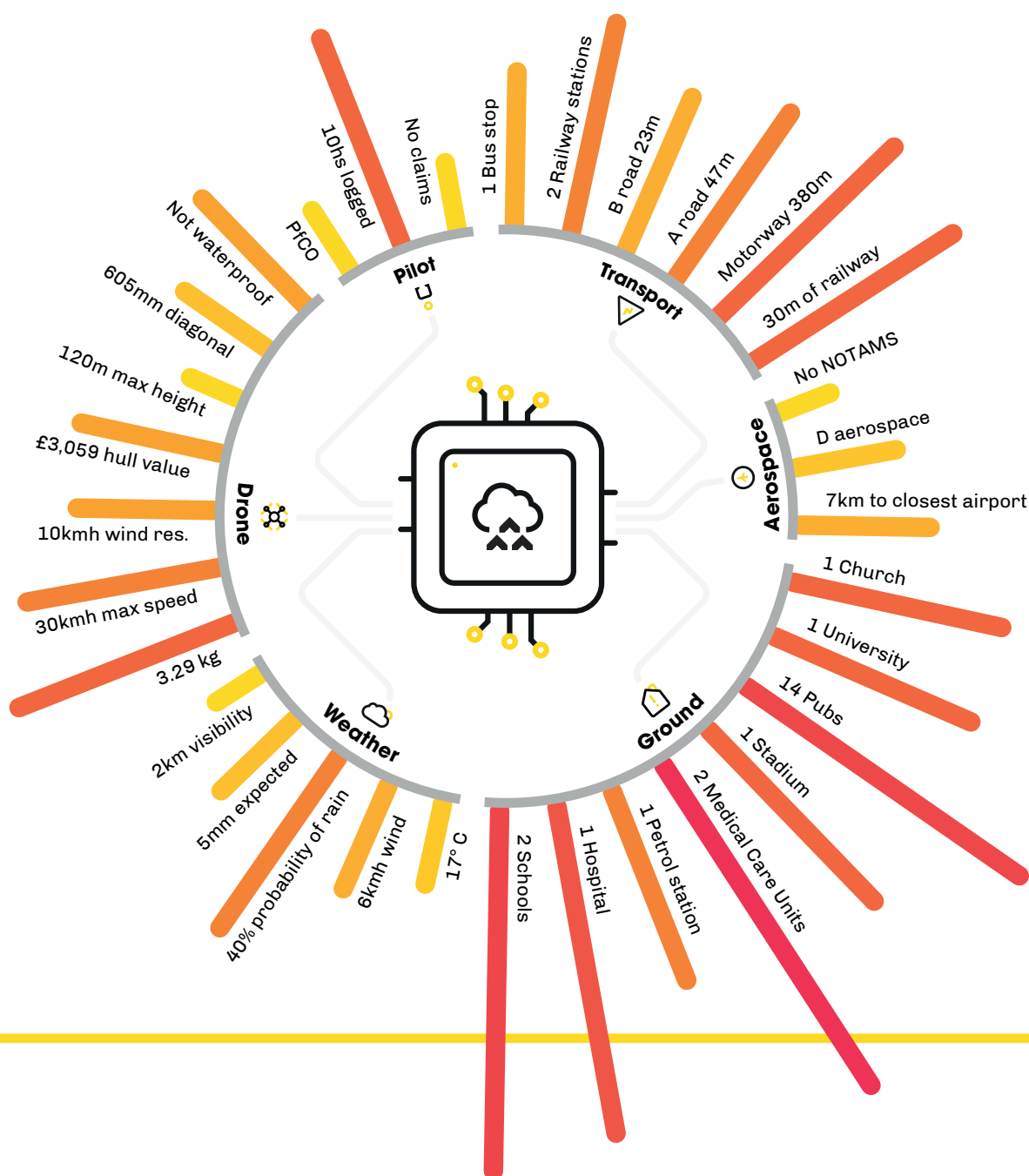




This 'Flight Risk Metric' (an indexed score between 1 and 100) represents the expected loss (technical premium price) of a single flight, allowing for the precise pricing of drone insurance on a per-flight basis.

Complex interactions between these varied data sets allow for a high degree of pricing complexity and accuracy. For example, a drone with a maximum wind resistance of 10m/s will receive a dramatically different Flight Risk Metric when flown in a light breeze compared to a strong gust.

Figure 5: Rating factors for drone flight risk

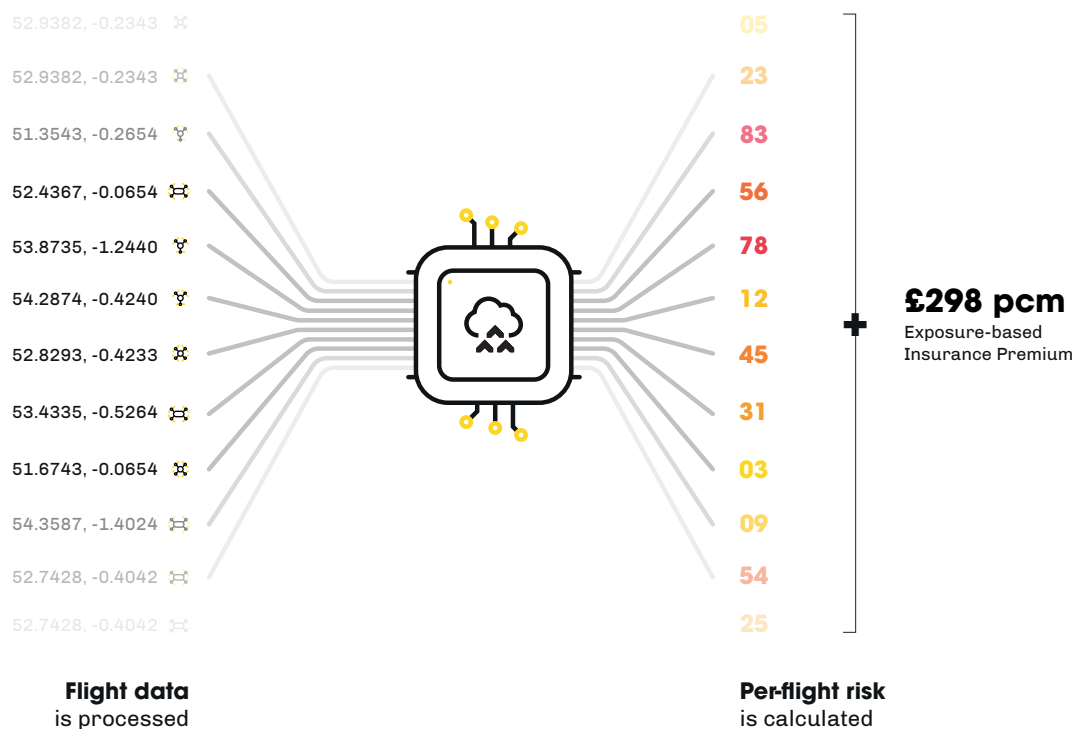


## Introducing Flock Enterprise: exposure-based insurance for connected drone fleets

Flock Enterprise is a first-of-its-kind insurance product, built from the ground up to accommodate the rapid global proliferation of drone fleets.

Just as the Flock Cover mobile app allowed SMEs to purchase 'pay-as-you-fly' drone insurance on a per-flight basis, Flock Enterprise unlocks exposure-based insurance at scale, and allows larger enterprises to pay for insurance only when they use it. This is achieved by leveraging Flock's Risk Intelligence Engine to automatically assess and price risk for each and every drone flight. These individual flight prices are aggregated, and paid in arrears at the end of each month.

**Figure 6:** Flock Risk Intelligence Engine for connected drone fleets



As a result, drone enterprises can for the first time pinpoint and quantify the risks (and associated insurance costs) of every single flight undertaken in a given month. This offers unparalleled visibility into risk at an individual flight or portfolio level. It also allows insurance premiums to be directly aligned with actual risks undertaken, rewarding enterprises that take proactive steps to actively mitigate risks.

All of this is achieved seamlessly (and with no need to install additional hardware or software) as Flock Enterprise syncs with third-party drone data collection platforms, ingesting the flight data it needs to assess and price flights.

See the case study on Texo DSI Ltd, which demonstrates how a global drone enterprise is already taking advantage of Flock Enterprise to align their insurance costs with their operations, as well as to identify and minimise their own flight risks.

## Case study: Texo DSI

Texo DSI Limited ("Texo") is the owner-operator of one of the world's most comprehensive and dynamic fleet of drones. Texo offer fully integrated survey and inspection services across a range of sectors, delivered by an advanced fleet of fixed wing and multirotor platforms.

Texo is committed to operating with the highest levels of safety, and have been awarded with the UK's most expansive and comprehensive set of congested area commercial flight permissions by the Civil Aviation Authority.

Given the specialist nature of Texo's fleet and the extreme conditions within which they typically operate, Texo were looking for a fairly priced insurance alternative that took their unique risk profile and approach to safety excellence into account.

During a dedicated development phase with Texo's in-house innovation centre of excellence, Texo, the Flock team identified how Flock Enterprise could be customised to optimise Texo's insurance costs and scale as their fleet of drones grew.

Following the launch of Flock Enterprise in December 2018, Flock has continued to work closely with Texo to ensure that their policy evolves seamlessly with their dynamic drone fleet.

*"Flock's insurance platform provides a transparent view of risk and pricing from an insurance perspective; we can now understand where exactly we are incurring insurance costs on a per-flight, per-drone and per-pilot basis. Flock provide an unparalleled granularity in the risk management space, and will analyse the flight data we collect to provide us with a detailed breakdown of exactly where and when we can take actions to reduce our own operations' risk exposure."*

David Williams  
Chief Operating Officer, Texo iHUB

FLOCK 



TEXO

## What's next for connected insurance

The world is becoming increasingly connected and autonomous. In the not-too-distant future it will be commonplace to see drones in our skies, driverless cars on our streets, and robots in our homes. These innovative and disruptive technologies present myriad benefits, but also bring a range of new and complex risks.

At Flock, we believe that it is time for the insurance industry to embrace such technologies, leverage Big Data, and rise to the challenge of pricing, insuring, and mitigating the risks of our rapidly evolving, autonomous world.

Flock Enterprise is just our first step as we seek to bridge the gap between today's insurers and tomorrow's technologies, making the world a safer, smarter place.

## About Flock

Flock is a London-based, VC and Government backed insurtech startup operating at the cutting edge of the data analytics and insurance space. Flock reinvented drone insurance from the ground up with its digital underwriting platform, which leverages real-time data to quantify, insure, and mitigate risks for its customers.

This scalable solution has unlocked a suite of data-driven insurance and risk management products in the drone industry, ranging from Pay-as-you-fly policies for SMEs, up to usage-based enterprise insurance for the world's largest drone fleets. Flock is now working with global insurers to launch a range of industry-leading products, and to make the world a safer, smarter place.

## Get in touch

To find out more about how Flock Enterprise insurance can enable and reward risk mitigation for your drone fleet, or to request a bespoke quote, get in touch with us today.

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