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Weiqiang Lin

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Flying through Ash Clouds: Improvising Aeromobilities in Singapore and Australasia

WEIQIANG LIN
Department of Geography, Royal Holloway, University of London, Surrey, UK

ABSTRACT Scholars have recently been concerned with how the aviation industry is assembled through a series of tightly coupled processes and relations that render it fragile and prone to disruptions. While not disagreeing with this view, this paper explores some alternative ways aviation can be reunderstood as something more emergent and adaptable. Two ash cloud events, in Singapore and Australasia, are elucidated to show how breakdowns in air travel seldom unfold without intervening human actions and spontaneous reformations. Suggesting that aerial systems are thus continually renewed, this paper seeks to recognize in (aero)mobilities their potential for improvisation, even as it acknowledges their riskiness.

KEY WORDS: Mobility, Aeromobilities, Assemblage, Risk, Improvisation, Human agency, Emergence

Introduction

Civilian air travel has attracted increasing interest within academia in recent years, not least owing to a rising curiosity about the sociocultural practices that order and animate its mobilities. Adey, Budd, and Hubbard’s (2007) stocktaking paper, six years ago, on exactly this subject is perhaps prescient in this respect, eliciting three possible areas for further interrogation in the study of air transport; namely, its cultures, its politics, and its ramifications on communities and the global economy. Indeed, scholars have since populated the literature with many such concerns, looking at an eclectic range of previously neglected dimensions, from the corporeal experience of flight (Budd 2011), to the sorting capabilities and tendencies of airports (Adey 2008a; Budd, Bell, and Brown 2009), and the forging of national identities through the theatrics of flight (Adey 2006, 2008b). Arguably, these various attempts to refract the multi-hued figure of the airplane through its equally varied environments have helped engender a more mottled appreciation of what it means to ‘fly.’ More than that, they have infused a certain ‘human’ quality back into what was simply a(n)other mode of transport, recasting the same as a breathing
system ‘central to contemporary global ordering … [,] without [which] there would [also] not be “globalization”’ (Urry 2007, 155).

Accompanying this idea of the indispensability of aviation to globalizing processes is the recognition that the same system is concomitantly vulnerable to various ‘exogenous’ shocks and disturbances (Donovan and Oppenheimer 2011). The eruption of the Icelandic volcano, Eyjafjallajökull, in April 2010, which resulted in the closure of major swathes of European airspace over 10 days, is a prime example of this, when millions of passengers, as well as goods bound for import/export, were left stranded around the globe. As newspaper headlines painted a near-doomsday scenario in the weeks to come, the unprecedented grounding of flights across numerous European hubs precipitated what was dubbed ‘volcano chaos’ (Booth 2010) and a ‘logistical nightmare’ for airlines (Anderson 2010), with losses resulting from the disruptions estimated to cost firms up to €2.5 billion (Gabbatta 2010). Meanwhile, academics – including several who later published in Mobilities – had too joined in the conversation, using this episode to evidence Urry’s (2007, 2009) previous warnings about the riskiness of large technical systems like aviation. While Birtchnell and Büscher (2011, 2) call the event ‘an eruption of disruptions’ and ‘a bloodless coup’ staged by the volcano, Adey, Anderson, and Lobo-Guerrero (2011, 338) reflect on ‘the power of ash and dust to alter mobilities at both an intimate and global scale.’ Underlying these depictions is thus a sobering message about the precarity of contemporary architectures of aeromobilities. Specific to the Eyjafjallajökull incident, the constituents that held airspace together seem to simply disintegrate upon contact with a basal world of elements and matter.

Indeed, to recall other similar events in the past decade, from 9/11 to the 2003 Severe Acute Respiratory Syndrome (SARS) outbreak, there exist no dearth of examples to evince the susceptibility of aviation to sudden disruptions. However, while this paper applauds recent scholarly efforts in unpacking the tightly knitted ways in which global air travel is ‘assembled’ – thus leading to its fragility – it also questions whether such a focus risks emphasizing too much on the ‘hardware’ of aviation systems, at the expense of the more flexible joints and sinews of human spontaneity that act as cushions and defectors of unexpected pressures. To be sure, to return to earlier ponderings about the threat volcanic ash poses to flight, airspace is, in practice, not always performed as a fixed set of rules, regulations, and technical guidelines, but is highly amenable to improvisation on the spot. As several authors observe with respect to the disruptions of April 2010, a new, almost-arbitrary zoning system to distinguish between three levels of ash contamination for the determination of ‘safe’ flight was invented overnight by Eurocontrol to remedy the crisis (Dopagne 2011; O’Regan 2011), intimating the inherent malleability, and survivability, of human-made mobilities regimes. While upon the formalization of these ‘standards’ one could argue that another round of anticipatory rule-making was replicated (Adey and Anderson 2011), I proffer that it remains salient to attend to these moments of system salvage, as ‘live’ windows to how emergences and systemic redesigns take place; here, not only are ‘normal’ aerial scripts truncated and suspended, but vital procedures are also reformulated on the spot, to aid in the convalescence of compromised aeromobilities.

In this context, my paper aims to complement existing knowledges about civil aviation; not by taking it apart at the point of its failure, but by considering how it can be – and has been – creatively refitted to accommodate moments of extreme stress right when they unfold. Revisiting the Eyjafjallajökull incident in a different light,
and combining that with tales from the more recent eruption of Puyehue-Cordón Caulle in Chile, this essay focuses on how the industry, in never being ‘fully assembled’, is liable to its own formulations of new spatial arrangements and unanticipated lines of flight during anomalous times. The rest of this paper is divided into five sections. In the next section, I expound in greater detail the ways in which academics have come to understand civil aviation as an assemblage of practices, networks, and effects, leading to its association with certain sensibilities and vulnerabilities. The third section then discusses how, as part of the same project, this new logic can reshape our knowledges about airspace, and render the case of Eyjafjallajökull an instructive one for advancing a ‘risky’ view of contemporary mobilities. Serving as alternative, though not necessarily contradictory, viewpoints, sections four and five then flesh out some observations of how two eruptive episodes (those of Eyjafjallajökull and Puyehue-Cordón Caulle) were peculiarly handled in Singapore and Australasia – once through (temporarily) accommodating airspace on the ground, and in the second instance through recalibrating airspace to a more flexible mode. A few final thoughts reflecting on how these findings implicate and diversify understandings of aeromobilities follow in the concluding section.

Tracking Flight Paths, Assembling Aviation

Diffusing the utilitarian focus of ‘an outmoded’ positivist transport geography (Shaw and Sidaway 2010, 503), recent scholarship has sought to ‘rediscover’ air transport as a culturally laden process, intricately intertwined with human society and its mobilities. Such a reorientation has helped rewrite knowledges about civil aviation in significant ways, reunderstanding the same as (much) more than ‘models’ with observable spatial patterns, predictable evolutionary pathways, and optimal states to achieve (see Chou 1993; Graham 1995; Oum and Yu 2000; Doganis 2006). Specifically, researchers are turning to the ‘new mobilities’ paradigm (Sheller and Urry 2006; Cresswell 2006; Hannam, Sheller, and Urry 2006; Urry 2007) for some fresh directions, and are giving greater credence to the process of becoming ‘aeromobile’ than to the cartographic vectors airline networks leave behind on a map. As Cwerner (2009, 3–4, original emphasis) sums up, this new work has ‘allow[ed] us to look at aeromobilities in their relations with various social networks and systems, therefore grounding or embedding them in processes whereby these mobilities, and their … distinctive spaces, networks, systems and environments, are effectively produced, reproduced, performed and regulated.’

Perhaps, due to its visibility as a mooring in today’s highly (aero)mobilized world, the airport is one space that has attracted much attention in the said literature. While Crang (2002, 571) describes life within airports as ‘emblematic’ of globalization, others are looking past their city-like appearance and conviviality to decipher how they function as ‘systems’ that identify the needs in, and prepare, modify, and manage aeromobilities at multiple scales. Pertaining to their internal mechanics, authors have variously examined the airport’s role as a complex of signs and symbols to guide human circulations (Fuller 2002; Cresswell 2006), a processor or filter that sorts through differently classified passengers (Adey 2008a; Lyon 2008), and even a ‘machine for selling,’ subtly trying to induce consumption among travelers-in-waiting through its architectural design and affordances (Lloyd 2003; Adey 2008c, 444). Upscaling this focus to consider how airports fit within wider economic processes, Derudder and colleagues (2007, 2009) have uncovered yet
another utility of these ‘global transfer points’ (Kesselring 2009), specifying their role in entrenching the centrality of a select few cities in global economic hierarchies, and in materializing uneven regional and national development across the planet (O’Connor 1995, 2003).

In other instances, scholars have looked beyond the conspicuity of the airport to interrogate how the aviation industry as a whole is caught up within similar dynamics of networks, relations, and compositions. In their seminal piece, Dodge and Kitchin (2004) argue that contemporary air travel cannot be seen as operating on just any ordinary spatial plane, but must be understood as constituted within a ‘real virtuality’ founded on software programs, and information and communications technologies. Coining the concept of ‘code/space’ to describe this ‘totalising aviation environment’ (Dodge and Kitchin 2004, 197) of codes and instructions that air travel now so heavily depends on, the authors argue that the air transport industry is not only dominated by computer systems, but has also been made subject to their temperaments. Specifically, they postulate that the failure of any part of this code/space (e.g. a system crash at check-in, or a technical fault in avionics) can instantly cripple the viability of passenger flight and aeromobilities. Although aviation is by no means the only activity adhering to such techno-centric forms of social organization (Dodge and Kitchin 2005), it arguably remains at the vanguard of the development of this new culture, intertwining materiality (in the form of travel) and virtuality (in the form of coded transmissions and exchanges required for that travel) in a tight iterative loop.

Turning to another prototype of such dyadic combinations, but factoring humans into the equation this time, a growing awareness has emerged as well with regards to the ‘cyborgian’ way in which (aero)mobilities are fashioned through, to borrow Haraway’s (1991, 194) words, ‘a hybrid of machine and organism.’ With the advent of ‘smart’ flight deck technologies such as ‘fly-by-wire’ and Traffic Alert and Collision Avoidance System, modern pilots now no longer need to rely on manual methods of flying and ‘seeing’, but instead monitor in-flight situations with the aircraft. Notably, ‘real-time’ computer simulations and aircraft monitoring systems are fitted onboard most modern flight decks today, and are responsible for relaying vital flight statistics and even ‘visual, aural, and tactile warnings’ to alert their operators to ‘imminent future dangers’ (Budd and Adey 2009, 1379). Adey’s (2010, 117–121) book Aerial Life more explicitly expresses this idea of the pilot’s body being at one with the machine. Getting into the brains of ‘airmen’ – a deliberate term to reflect the gender asymmetry of piloting in the 1920s – and sorting through their psychological propensities while in-flight, Adey’s discussion elicits a blurring of boundary between human and machine, as pilot and aircraft are fused and are required to endure or accommodate to each other’s operative limits. Seen as such, the human is ‘intimate’ with ‘his’ machine (Mindell 2002, 69), and becomes ‘a mass of pipes, cables, pumps, propellers and struts,’ which, like other parts of the airplane, is expected to work ‘in the most efficient way possible’ (Adey 2010, 117).

This body of research has evidently steered academic interests in air transport in new and unprecedented directions. In particular, it has reconfigured knowledges about flying, and made them more sensitive to the delicate ways in which complex systems have to be specified, organized, and assembled first, before passenger flight can be ‘properly’ realized. Not only does this encompass the management of passenger flows at airports, and the strategic positioning of hub and transit cities at a global scale, the literature has also revealed how aeromobilities themselves are the product of
contingent coalescences between infrastructures, computer systems, flying machines, human bodies, and other intervening factors. Such a theoretical standpoint, stressing on the human and nonhuman networks, or ‘assemblages’, of things that make up aviation, has contributed to the idea that the ‘air’, and the mobilities that go on within it, are relationally and heterogeneously composed through everyday practice and structuring processes, rather than (pre)existing as an a priori (DeLanda 2006). More critically, it has unlocked a sense of socio-materiality within air transport, conferring it with a productive quality of compositionality and tight operational precision.

This leads on to the identification of a second, perhaps more urgent, trope in this new research. To wit, in recognizing how ‘multiple … systems … intimately rely on each other in producing the wider circulations and metabolisms [of air travel]’ (to paraphrase Graham 2010, 4), scholars are exposing the possibility that modern society is setting itself up for frequent disruptions by being overly reliant on these tightly coupled, and hence fragile, systems that compose aeromobilities. As Urry (2007, 139–141) notes, the global aviation industry and its networks are ‘sites of riskiness,’ where small disturbances can quickly ‘produce cascading and positive feedback effects’ that can overwhelm ‘those flying,’ ‘those organizing and managing those flights,’ and even ‘those on the ground.’ Not surprisingly, actual cases of such unruly scenarios have also been highlighted in recent years. While Aaltola (2005) spells out the geopolitical implications of the 11 September attacks on the hubs and spokes of the global aviation order, Ali and Keil (2006, 2010) highlight the threats posed to world trade, as well as the international responses that had had to be coordinated, following the rapid transmission of SARS through international airline networks (see also Bowen and Laroe 2006). These sobering pictures all underscore the tenuousness of the systems that ‘advanced’ societies have built to sustain their ‘mobile lives,’ raising questions about the wisdom of inhabiting an extensive ‘field of economy, society and resources’ so spread out across the globe (Elliott and Urry 2010, 9). In the following section, I (re)turn to the airspace closure in Europe in April 2010 to elucidate why the Icelandic eruption was such an apt example for delineating these new research contours. This is followed by some alternative viewpoints for consideration.

**Revisiting Eyjafjallajökull, Unraveling Airspace**

European airspace appeared to have been compromised in the spring of 2010, as a volcanic eruption led to its virtual shutdown and multi-day evacuation. At the time of Eyjafjallajökull’s maximum impact (on 18 and 19 April), it was estimated that around 19,000 flights had to be canceled every day, clipping almost 30% off the world’s scheduled passenger capacity (IATA 2010). According to the same report, around 1.2 million travelers were affected each day, and the European Commission computed that the total number of passengers unable to travel worldwide had topped 10 million by the end of the ordeal (Gabbatta 2010). Meanwhile, the disruption had cost businesses large sums of money. The airline industry was said to have suffered US$1.7 billion in lost revenue, with airline association (IATA) chief, Giovanni Bisignani, warning that the crisis could have a ‘devastating’ impact on an industry already teetering with multi-billion dollar losses in the previous year (BBC 2010a). Companies that depended on air transport for business were likewise hit. From airline launders to travel agencies and to exporters and importers of perishable goods like flowers and food, each additional victim only testified to how
deeply concatenated – both backward and forward – aviation was with a myriad of other industries.

How a simple atmospheric disturbance could end up closing off such large swathes of Europe’s airspace and unleashing so much mayhem arguably requires an understanding of how airspace works in the first place. Being largely amorphous in form, airspace has the distinct quality of needing to be made visible and ever-calculable for flight operators to properly work on. Budd’s (2009) work is perhaps apposite in this respect, when she seeks to reveal how airspace is structured – i.e. as a tight legal-technical framework of air rights, airways, control zones, and aeronautical procedures. Besides fixing designated ‘highways’ along which airliners must travel, airspace figures as an event space that must be appropriated and ‘scheduled’ for use – including by nontransport users like air show organizers, the military, and the media – in an orderly fashion. During ‘no-fly’ periods, ‘[d]etails of the lateral, vertical and temporal extent of th[e] restrictions [in place must be] communicated through … charts, Notices to Airmen (NOTAMs) and pre-flight bulletins’ (Budd 2009, 119) to warn pilots to keep out. In this way, airspace is traversed in a highly regulated manner, and the apportionment of its ‘time-space’ must go on without compromise to its safe operation.

The Eyjafjallajökull eruption clearly upended these rulings by giving no warning whatsoever about the ‘lateral, vertical and temporal extent’ of its hazy occupation. Instead, it pumped into the atmosphere streams of abrasive volcanic ash, whose incompatibility with aviation was only too familiar. In 1982, all four engines of a British Airways Boeing 747-200 shut down during a flight from Kuala Lumpur to Perth, Australia, when it encountered volcanic ash ejected by Mount Galunggung in Indonesia (Job 1996). The incident not only left the jet gliding for 13 min without power off Java’s southern coast, it also badly sandblasted the aircraft (Brennan 2007). A repeat incident in 1989 involving Alaska’s Mount Redoubt and a similarly impaired KLM Boeing 747-400 prompted the International Civil Aviation Organization (ICAO) to set up nine regional Volcanic Ash Advisory Centers (VAACs) around the world to monitor and report on future ash incidents (Corp 2010). Besides introducing improved detection techniques, the convention of issuing NOTAMs to notify pilots to keep away and, in effect, enforcing a ‘zero-tolerance’ policy for volcanic ash was also established (ICAO 2004; Kihm and Macer 2011). Notwithstanding, though these efforts were designed to adapt ash threats to the normal operating mechanics of airspace, their stiff configuration was what precisely opened a loophole for the unexpectedly protracted timeline of the Eyjafjallajökull eruption to become disruptive again in the current context. Besides imposing a state of ‘self-organized criticality’ (O’Regan 2011), the unusually long flight ban quickly rippled through other aspects of the system, rendering a finely interlinked European airspace both untenable and unstable.

As academic analyses bear out, the ‘disjointed rhythms’ (Martin 2011, 88) caused by Eyjafjallajökull uncovered numerous weak links in the networks that (European) airspace was ensconced in. Aside from feeding on aircrafts’ ‘allergy’ to ash, the temporary closure also resulted from the fragile ways in which airspace was organized in Europe: not as an open span, but a complex patchwork of boundaries anchored to sovereign terrestrial divisions, and managed by national air traffic control (Adey, Anderson, and Lobo-Guerrero 2011, 340). The consequent fragmentation of flight paths and oversight jurisdictions further made it impossible for airliners to travel through to their destination without encountering one of the blackout zones. This was
exacerbated by the fact that the ash cloud behaved in a contradictorily less territorial way. Mixed into the atmosphere, the irritant had no distinct borders, but only a vague ‘directional tendency’ (Adey and Anderson 2011, 15) that confounded the strict geometries of political space. Its consistency, durability, and actual effects on aircraft in this particular instance were also largely unknown, adding to the sense of loss of control over the operative codes of air navigation. Closing the loop between the aerial shutdown and the ensuing immobilities on earth, this confusion further morphed into uncertainty over whether the millions of stranded passengers would be eligible for airline compensation and insurance payouts, and hence be able to continue on their journeys (Brignall 2010). In the end, it was the resourcefulness and ability of ordinary travelers to find themselves alternative modes of transport and communication that had helped them escape the predicament (Guiver and Jain 2011).

Through these reflections, the ash cloud event has but only reinforced recent tropes in mobilities research about the vulnerability and riskiness of air travel (Urry 2007, 2009). While it is acknowledged that subsequent redefinitions of an aircraft’s tolerance level for ash have likely made the system more resilient against future shocks (Dopagne 2011), some scholars remain skeptical about the efficacy of such measures to ‘re-know’ the system. For Budd et al. (2011), the disruption critically exposed the taken-for-granted contingencies of airspace and its production, and unmasked the limits of its technological capacity; for Adey and Anderson (2011, 18), the event laid bare a flawed aviation architecture that is predicated upon the imperfect logics of calculation and anticipation, thereby creating a situation where ‘mobilities always made with the potential to be disrupted’ are generated. Set in this tone, the concerns of these scholars refer to a structural rather than symptomatic problem in aeromobilities, harking back to the dangers that global – particularly ‘advanced’ – societies are exposing themselves to, by placing such great faith in intrinsically risky assemblages of aviation.

Despite these good-intentioned admonitions, I suggest that there remains some saving grace in aviation systems that are constantly under threat of breakdown. That source of redemption ironically comes from the human agents who, in the first place, designed these (fallible) systems, but are thus also able to succor them. As Kitchin and Dodge’s (2009, 98) recent reflection on their code/space thesis makes clear, the idea that ‘code’ or software – and one could extrapolate, other inanimate objects, infrastructures or conventions that compose aeromobilities – ‘establishes the spatiality of much of [air travel] in a deterministic way … [and] with universal outcomes’ is necessarily a misplaced one. Instead, as they continue, ‘[c]ode/space is never consistently [assembled or disassembled], but … is always produced; always in a state of becoming, emerging through individual performances and social interactions’ (Kitchin and Dodge 2009, 98). Their exemplification of this less rigid position through an ethnographic study of human interventions present in check-in processes, airport security procedures, and immigration formalities confirms the negotiability and pliability of even this seemingly unbending ‘code’ system [see also Peters (2009) on renegotiations at KLM’s Hub Control Center]. While it constitutes a set of processes designed to mediate air travel, ‘code’ is categorically ‘not simply law … [but formations that] emerge through the interplay between people and [system] in diverse, complex, relational, embodied and context-specific ways’ (Kitchin and Dodge 2009, 111).

The example of Kitchin and Dodge’s (2009) code/space ought to impel similar questions for other constellations of practice within aviation – whether these can
indeed be made more liable to negotiations and human inputs of creativity while in
process. In emphasizing this aspect of flying, my goal is not to presume the superior-
ity of ‘humans,’ but rather to draw attention to how they may exhibit a level of auton-
omy and agency apart from the machines and systems they are inserted into (cf.
Adey 2010). Valorizing their role in times of emergency, I propose that aviation
research needs to be brought into closer conversation with an ‘assemblage theory’
that is more provisional and rhizomatic (Deleuze and Guattari 1988; DeLanda 2006);
or as McFarlane (2011, 653) would puts it, infused with a greater sense of ‘indetermi-
nacy, emergence, becoming, processuality …’ As Cresswell and Martin (2013) can
lend further import to this more open-ended stance, ‘order’ and ‘disorder’ in
mobilities are not binaries that compete with each other in a zero-sum game, but are
rather relative states that feed off one another, and propel mobilities forward in a
creative fluctuation of turbulence. Seen as such, ‘breakdowns’ in aviation do not
simply signal an unraveling of a tight tapestry; instead, they wield a hitherto
unexplored capacity, when combined with human agents, to become opportunistic
spaces for the reassembling of aeromobilities, just as they represent disruptive
moments of disassembling.

In this context, I return to the examination of ash-contaminated airspace to consider
how it can be alternatively imagined as such a fertile incubator of improvisations –
even if these novel devices later get written into (fragile) ‘law’ – during interim
periods of ‘lawlessness.’ To flesh out these arguments, I revisit the Eyjafjallajökull
eruption, and the more recent episode of the Puyehue-Cordón Caulle, in the
Singaporean and Australasian contexts, to contemplate how these ashy storms were
weathered as they occurred.

**Accommodating the (Un)friendly Skies**

One of the most visible effects of Eyjafjallajökull had been the stranding of millions
of passengers who were stopped in their tracks at airports worldwide. Not only did
the airspace shutdown frustrate the plans of intra-Europe travelers, it also left many
marooned in countries far away from home, for days and weeks after travel restric-
tions were lifted (Jones 2010). In many cases, the prolongation of the stranding was
due to the inability of airlines to cope with the massive backlog of passengers,
especially in the face of how rigidly the industry was structured around ‘tight
schedules and time-space commitments premised on the punctuality of flights’
(Guiver and Jain 2011, 42). In other instances, it was reported that some airlines,
like British Airways, were trying to ‘profiteer’ from the crisis by offering travelers
trapped overseas replacement seats at premium fares of as much as £4700, if not
face severe deferments to their return (Daily Mail 2010). These contradictory devel-
opments of supposedly overwhelmed airline networks and, at the same time, spare
capacity going at prized rates meant that some passengers would have to wait
longer than was necessary before their journeys could be completed. More critically,
it signaled how multidimensional the ‘problem’ was – involving regulators, airlines,
timetables, and yield management issues – such that the (precarious) state of
Europe’s airspace was never the only narrative in the crisis.

Airports and their operators arguably constituted another important, but so far
neglected, stakeholder in this event. Found at the terminal end of an airspace that
had become temporarily discontinuous, these infrastructures were now the reposito-
ries of passengers who, because of visa restrictions, cash constraints and/or their
transit status, became immobilized. For airports of aspiring global cities, the Eyjafjallajökull eruption provided an especially valuable opportunity for them to fashion themselves as competitive, quality hubs. One such contender was Singapore’s Changi Airport, the seventh busiest international airport globally with an annual traffic of over 45 million (Airports Council International 2012), and winner of over 390 accolades, including the Skytrax award for ‘World’s Best Airport’ in the year of the eruption (Skytrax 2010). While Singapore’s airspace, being located some 7100 miles from Iceland, was never compromised by the ash cloud, its status as a major transit hub between Australasia and Europe meant that it was to host thousands of passengers who either could not return to or complete their journeys to Europe from Oceania. According to official estimates, about ‘5000 non-Singapore residents were stranded at the peak of the crisis,’ as ‘more than 200 flights to and from London, Frankfurt, Amsterdam, Milan, Moscow, Munich, Paris and Zurich were cancelled’ (Changi World 2010, 12). Given that there was virtually no other alternative for them to get to their destinations, the Changi Airport Group (CAG), the company which runs Singapore’s airport, had to ensure that their response and mitigating gestures would not only help partially restore a sense of normality for those stranded, but also cast the airport in the best light possible.

The CAG had been swift in calling for extraordinary measures to be taken to ensure that the 5000 grounded in its midst were given proper care. While Changi was by no means the only airport that had extended a helping hand to those stranded – Frankfurt being another airport that had taken the trouble to offer its passengers food, gym, and shower facilities and clean underwear (Spiegel 2010) – the Southeast Asian air hub was perhaps more conscientious about projecting these efforts as part of its brand slogan, the ‘Changi experience.’ As a longstanding source of its pride, the CAG took the opportunity to laud the ability of their hub to avail a wide range of facilities, from shopping malls to cinemas, to the stranded passengers. For those who were rescheduled to travel at a later date, but were unable or unwilling to be accommodated in the city, the airport’s staff set aside special areas for them to eat and sleep, and provided them with ‘Care Packs’ worth S$200 (US$164) each, comprising complimentary meals, free Internet access, phone cards, and even free tours of the city (Bridging Skies 2010; Changi World 2010; Jackson 2010). These out-of-the-way gestures, requiring both overtime work and monetary incurrence, were not only reciprocated, at the end of the crisis, through the ‘many bouquets and notes of appreciations’ sent to the CAG, but the airport also garnered much praise from those passengers who had received help (Changi World 2010, 12). The publicity ‘investment’, in this sense, had paid off for Changi, who had managed to not only capture the hearts and minds of potential repeat customers, but also affirm the airlines’ faith in its favorability as a hub.

Changi’s bid to cushion the severity of the stranding to (partly) boost its own image and international profile, however, did not stop at the creature comforts it provided to travelers who were unable to get home. Its management had long made it a priority for the airport to maintain a close relationship with its nonpassenger clientele, and to use these networks built with them to enhance its service offerings. During the week-long grounding, the CAG was instrumental in bringing together a number of these partners to avert travel and logistical chaos at Changi. These parties included the Singapore Tourism Board, which put together tours and discount packages for the stranded passengers (Bridging Skies 2010); the Immigration and Checkpoints Authority of Singapore, which assisted in extending visitor visas for
those whose status had expired (Bridging Skies 2010); and Singapore Airport Terminal Services (SATS), which facilitated in the recovery of travel and transshipment schedules, as well as deployed ‘airport ambassadors’ to ‘show compassion, bring peace of mind and comfort to stranded passengers’ (SATS 2011, 20).

In addition to these collaborations, the CAG also worked hand-in-hand with airlines to find alternative accommodation for some of those affected by the flight cancellations, and to help ease over-crowding at the terminals. When hotels in Singapore became full, the CAG, with cooperation from the airlines, managed to arrange for some of the affected passengers to be ferried to neighboring Malaysia for temporary hotel stays, before being brought back to the airport once their replacement flights were finalized (Lim 2010). These creative improvisations underscored the highly flexible ways in which aviation assemblages could be formed and re-formed in the midst of a ‘crisis.’ If, earlier, the strategy involved caring for, and normalizing, the pent-up (im)mobilities waiting at the thresholds of airspace, this time it had entailed expanding the accommodative capacity of this same space – beyond the aerodrome and across transnational borders – to afford the stricken system more time to react to the passing storm. Through its ‘order-ly’ management of the crisis, the CAG was able to capitalize on the event to reinforce Changi’s centrality in global networks. While these solutions did not directly get travelers flying again, they highlight how the agentic inputs and responses of a group of people were able to temporarily reconfigure airspace to achieve other ends. Through various space shifting measures, stresses in one part of the system (Europe’s airspace) were effectively redistributed to another existing infrastructure (Singapore’s airport), and its newly incorporated networks (extraterritorial space), to prepare it for greater mileage in the future.

The flashes of human spontaneity and improvisation witnessed at Changi in 2010 have not only bolstered the airport’s brand name, but also uncovered a more ambivalent way of looking at the assemblage of flying. Like Kitchin and Dodge’s (2009) socially inflected ‘code/space,’ the airspace that Changi inhabits, while being part of an intricate network of (pre)structured relations, is also brimming with its own potentials to negotiate vulnerabilities and periodic emergencies. In fact, the CAG (and its predecessors) has for some time now been at the forefront of revising rules and practices in the industry to advance its own lead over other rival hubs. At the height of the 2003 SARS outbreak, Changi was not just another airport that was obligated to deploy thermal sensors to enhance health safety for passengers (Ali and Keil 2010); it was in fact the birthplace of that Infra-red Fever Screening System, a solution its operators had adapted from military technologies to help the airport regain the confidence of the traveling public (WHO 2003; ST Electronics 2006). Similarly, when aeromobilities were disturbed by the transatlantic terrorist plot involving liquid bombs in 2006, Changi’s regulatory arm assumed the responsibility to develop restitutive measures to protect Changi’s traffic and its retail function. In particular, the design and harmonization of carriage solutions for cabin liquids, aerosols, and gels (LAGs) in clear bags, and tamper-proof bags for duty-free items, had been the brainchild of an ICAO (2007) meeting that Singapore’s aviation authority chaired, constituting another example of how the city’s aviation assemblages were continually being adapted at each critical juncture by its people.

In this context, air transport systems paradoxically buckle and also do not buckle in the face of unanticipated events. To interpret this issue more imaginatively, ‘disruptions’ do not so much expose ‘inherent’ faultlines within aviation, as to provide
it with opportunities to evolve, in a continuously emergent process of collapsing and rebuilding. Sometimes, this may culminate in the re-coding of the system with even tighter rules, such as the recent LAGs guidelines and recalibrated ash limits; other times, remedial actions are temporary and ad hoc, but nonetheless go towards enhancing the appeal of (future) air travel. By thus switching the focus from one of a (statically) heightened state of precarity to one of adaptability in the system, it becomes possible to appreciate these assemblages as not just straightforwardly ‘risky’ or ‘anticipatory’ (Adey and Anderson 2011; Budd et al. 2011), but open-ended, regenerative, and implanted with the seeds of conflict resolution and self-renewal at unexpected moments. As CAG consultant Hans Elnan concludes, ‘[f]lexibility, reaction time, and innovativeness are key attributes for preparedness to cope with the unpredictable’ (Changi World 2010, 9). As seen in Changi’s case, it is less about capitulating to ubiquitous risks, than about making aviation suppler, for it to rise above – or thrive beneath – unfriendly and turbulent skies.

Recalibrating Airspace, Reassembling Flight

The Eyjafjallajökull eruption was in fact not the only volcanic ash incident the aviation industry had to deal with in the past three years. Within a short span of just 14 months from the ‘original’ eruption, the rumblings of another Icelandic volcano, Grimsvötn (Meikle 2011), as well as those of Mounts Merapi and Bromo in Indonesia (BBC 2010b, 2011a) and the Puyehue-Cordón Caulle in Chile (Daily Mail 2011) were also heard. The Puyehue-Cordón Caulle, in particular, garnered almost an equal amount of attention as Eyjafjallajökull did, as ash from the Chilean volcano circumvented the southern hemisphere twice, and ensnared air travel for weeks for a second time. Ironically, South America, the source region, escaped the eruption’s worst effects. There, thousands of international and domestic flights were canceled over two weeks, while tens of thousands of passengers found themselves stranded at airports across Asia Pacific, including Sydney, Melbourne, Auckland, Los Angeles, and a few Asian hubs. While the severity of this eruption paled in comparison to Eyjafjallajökull, the divergent stories it tells, and the distinctive strategies deployed to contain the crisis, pose several new questions about how aeromobilities are continually made and unmade. More pertinently, this round of disruptions derives its instructiveness from not only being, once again, cushioned by human actions and interventions, but also being indirectly produced by them.

One significant difference of the Puyehue-Cordón Caulle episode was that a blanket ban on airspace was never imposed by any of the affected nations in Australasia. A patchy blackout of the sky like that which occurred in Europe was thus also averted, making this incident qualitatively different from that in Europe a year earlier. What regulators, like Australia’s Civil Aviation Safety Authority (CASA), the largest in the region, did was to instead issue NOTAMs to pilots and air operators, and to require each airline ‘to use their approved safety management systems to determine which flights should go ahead’ (Gibson 2011). Alongside this relatively hands-off approach, the regional VAACs in Darwin and Wellington came together and assumed the joint responsibility of feeding information and meteorological data to the respective states and their airlines (ICAO 2011). These regulatory arrangements in effect realized an airspace that had had its ‘usual’ scripts and guidelines suspended, and replaced by an alternative, more open-ended decision-making process. Described by
the Darwin VAAC as a contingency plan put together ‘on the fly’ (Lahey 2012, 17), the resolution to temporarily fragment oversight powers was a compromise reached to keep planes flying, and to avoid the kinds of problems encountered in Eyjafjallajökull (Calligeros 2011). Put more succinctly, the reordering of airspace to a more flexible mode was a strategy deliberately devised to avert a large-scale, unilateral closure in Australasia, by co-opting multiple partners in the appraisal and governance of an ash-contaminated airspace.

The (partial) transfer of power to airlines to settle on the suitability of flight operations however introduced a new set of dynamics that triggered its own complications. To wit, the co-optation of airline decision-makers into the process of determining whether or not aeromobilities should go ahead led to the tethering of aviation to a more imprecise (and impromptu) logic of calculation, no longer composed by pre-specified regulatory procedures and clear chains of command; in this particular context, aviation was entangled, too, with the interests of profit-driven enterprises and motivated actors, who had the capacity to enroll new elements and considerations into corporate equations as the event unfolded. Unlike in Europe where blanket flight stoppages became the de facto response of all airlines, air transport operators in Australasia could, and had to, individually assess the safety and reputational implications of maintaining air services in the midst of the lingering ash. In addition, they had to financially weigh the extra costs incurred by rerouting planes around areas where ash was reported to be detected – an option that was available to them and their competitors. Armed with these new choices, a situation where flights were unevenly canceled between different airlines – despite the identical routes plied – began to emerge (Williams 2011). This unusual phenomenon highlighted the need to account for the complicated webs of human-mediated ‘calls to (in)action’ to gain a more nuanced understanding of how aeromobilities were constituted during the Puyehue-Cordón Caulle episode. Rather than abiding by universal and pre-determined scripts, airline managements reacted to a diversity of other calculations strategic to their businesses, and were allowed to adapt their operations in real time.

One airline that had tried hard to fend off any potential disruptions was Air New Zealand. Although its operations were not immune to airport closures and sporadic cancellations due to excessive ash, the Kiwi carrier was able to fulfill a large part of its schedules – including to and from Australia across the (most affected) Tasman Sea – by having its planes adjust their flight paths or fly at lower altitudes, below the base of the ash cloud (BBC 2011b; Daily Mail 2011). According to the airline’s chief pilot, ‘[t]he extra distance involved [due to these maneuvers] required the use of 10% more fuel, but ha[d] meant customers were able to safely get to where they needed to go’ (Johnston 2011). These initiatives contrasted with the actions that other airlines took during the same period. In particular, Australia’s national carrier, Qantas Airways, became one of the first airlines to halt services between mainland Australia and Tasmania, as well as to/from New Zealand in their entirety (BBC 2011b). This self-imposed flight ban was later extended to Qantas-branded domestic flights within New Zealand, and to its low-cost offshoot Jetstar’s trans-Tasman operations, including a (remotely affected) long-haul service between Singapore and Auckland (Davison 2011). Curiously, cooperation between the two VAACs, Australia’s CASA, and New Zealand’s Civil Aviation Authority (CAANZ) in sharing ash and meteorological data with each other (CAANZ 2011; ICAO 2011) did not seem to mend this discrepancy. While Air New Zealand averted a total shutdown of its
system, as the regulators had intended by not imposing a blanket ban, carriers such as Qantas fostered their own aeromobile stoppages by choosing to ground flights on the ‘ultra-conservative’ pretext of absolute safety (Calligeros 2011).

The frustrating situation of having some passengers fly while others not on the same routes reached a boiling point when the two airlines began to hurl veiled criticisms at each other. In a defense of his company’s actions, Qantas’ chief executive Alan Joyce (2011) communicated in an email message to the airline’s frequent flyers that ‘[w]ithout certainty about the density of the ash, [Qantas did] not consider it safe to fly,’ implicitly questioning the decisions taken by Air New Zealand, along with those by Virgin Australia, Tiger Airways Australia, and other international carriers that had later also begun to run near-normal schedules. In an online response four days later, Air New Zealand’s own chief executive Rob Fyfe (2011) retorted by pointing to his airline’s ‘commitment to adapting its services and accepting the cost of a higher fuel burn to fly longer tracks at lower altitude,’ before taking a swipe at Qantas and Jetstar for their plain refusal to fly, and their ‘strange’ willingness to transfer their customers onto other supposedly ‘unsafe’ airlines. Dismissing ‘malicious rumours [emerging] from the Australian market’ that eight Air New Zealand aircraft were stricken by ash damage, Fyfe (2011) went on to predict that Qantas would ‘come under further customer and media pressure if they continue[d] to adopt this strategy of grounding aircraft,’ and forewarned that ‘misinformation and false rumours’ would continue to circulate even as these discrepant policies persisted in the market.

The war of opinions between the company heads clearly indicates the differing appetites the two organizations had for operating in an anomalous environment thrown up by the volcano. More reflexively, it traces a part of the conflict between Air New Zealand and the Qantas Group to the divergent approaches the two companies espoused themselves to, as they sought to respond to the situation in their own terms. To be sure, the possibility for disagreement must, in the first place, be traced to the relatively accommodative stance that regulatory authorities in Australasia had taken in response to the ash threat. The recalibration to a more laissez-faire style of (self-)regulation not only helped keep airspace open both literally and interpretively, but had allowed airline operators to make provisions to maintain services based on their own realities of ‘airspace’. Inevitably, this strategy entailed the possibility that some airlines would undertake blanket flight cancelations on their own accord, precipitating an uneven field of disruptions across the region’s aeromobile networks. What figured as an unequivocal case of aviation’s vulnerability in Europe thus proved to be more ambiguous and indeterminate in Australasia, requiring a more variegated understanding of air travel and its purported risks (cf. Urry 2007). Instructively, the Puyehue-Cordón Caulle episode was never wholly about breached aerial systems or failed anticipations; instead, it was an event heavily inflected by relatively imprecise human negotiations, perspectives, and decisions, even as it was materially rewoven by the Chilean volcano.

**Conclusion**

Throughout this essay, my goal has emphatically not been to minimise the importance of recent academic research stressing the assemblaged and risky nature of aeromobilities (Adey et al. 2007; Urry 2007, 2009; Budd et al. 2011). Rather, the two cases I have elaborated on are intended as provocative vignettes, aimed at raising
further questions about how aviation systems can be recast as compositions that are more provisionally assembled, and shrouded with a greater sense of indeterminacy, turbulence and, sometimes, ‘off the cuff’ improvisations (see McFarlane 2011). In particular, both examples – relating to Singapore Changi’s impromptu (and partly self-promotional) efforts to contain the Eyjafjallajökull airspace glitch, and the re-calibration of Australasia’s airspace to a more flexible, and freely interpretable, mode during the Puyehue-Cordon Caulle eruption – are purposed to show how aeromobilities, while overlain by particular systemic structures and rigidities, are never fully scripted. On the contrary, they are perennially open to new spatial configurations and unanticipated lines of flight, especially during times of apparent (or potential) disruption. Rather than ‘unraveling’ when conditions cease to be optimal or predictable, therefore, they hold the potential to be spontaneously reaccommodated and rerationalized.

One ingredient I have identified as requisite to such processes of improvisation is that of human agency. To some extent, this risks being misread as an endorsement of the primacy of humans, but my paper is really more interested in returning social actors to a place where they can be more readily recognized as partners in assemblage-making and stakeholders in the socio-material world. As Kitchin and Dodge’s (2009) revisitation of their code/space thesis clarifies, organized practice is often overdetermined as having the power to (remotely) prescribe particular outcomes, when they in fact are constantly being (per)formed out of human negotiations and adaptations to emergent situations. In following this line of argument, my two examples have thus sought to uncover how airspace, and the mobilities it carries, goes beyond a single definitive network of tightly coupled, anticipatory arrangements (see Adey and Anderson 2011; Adey, Anderson, and Lobo-Guerrero 2011) – including future ones – to be buoyed too by human agents who continually make fresh interventions on, and add new vested interests to, assemblages of the present. Through such an optic, aeromobilities can then reserve some semblance of lasting resilience even as they are fragile, and be better appreciated for their purpose as constellations that were first created, and recreated, in service of (human) mobile desires.

This leads on to a further consideration on the nature of aviation’s malleability. While it is well known that the air transport industry is susceptible to evolution and change (Graham 1995; Doganis 2006; Urry 2007), little has been theorized about the ‘trigger points’ that drive and sustain these transformations. In this respect, the Singapore and Australasia case studies offer a few instructive pointers. In particular, remedial actions spontaneously taken in reaction to the volcanic ash incidents intimate that complex systems like aviation exhibit their greatest openness to change not when they are working smoothly, but when unexpected stresses upset past (human) anticipations. While efforts to contain systemic ‘crises’ may not necessarily result in their total restoration, the experimentation with alternative practice and methodologies during these phases of disjuncture is arguably what paves the way for future conventions, standards and regulatory ‘fixities.’ In this sense, it is fruitful to rethink the significance of disruptive episodes not (just) for how they attest to mobile society’s vulnerability (Budd et al. 2011), but for their simultaneously reproductive effects on mobile processes. Whether these interruptions concern ash intrusions or terrorist threats, it is presumably through such moments of breakdown that new morphologies are conceived and enabled.
Taken together, the sum-total of this essay is less about contesting realities, than about exploring new vantage points from which to imagine mobilities. Civilian air travel may have provided us with a cautionary backdrop to think about how modern society’s futures are closely intertwined with precarious infrastructures that can sometimes fail (Graham 2010), but this is perhaps not the end of the story. Indeed, while mobility systems are fragile, their less-than-sturdy structurings are also what render them flexible and capable of (self-)renewal on another front. By such a different construal, these human-crafted architectures of conveyance do not so much ‘fall short’ of their intended functionality, as merely undergo new rounds of remobilization, or reordering (Cresswell and Martin 2013), with each disruption. Veritably, it may very well be this imperfect and never-ending quest for a ‘better’ system that exactly makes air travel – and other forms of mobilities – such socially engaging and humanly rich affairs to research on.

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