FROM THE GROUND UP:
CONCEPTUALIZING THE SPACE OF LOS ANGELES COMMERCIAL AEROMOBILITY

by

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A dissertation submitted to the Faculty of the University of Delaware in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Urban Affairs and Public Policy

Spring 2014

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ACKNOWLEDGMENTS

I am most appreciative for Dr. Robert Warren, my committee chair. You have given me seemingly boundless insight and guidance at all points throughout the dissertation process. I would also like to thank the rest of my committee — Drs. Ames, Justice, and Moss — for your feedback and patience. I'm more proud of my work here because you stand behind it.

I owe a special thanks to the friends I made at the University of Delaware. Bakry, I count your friendship as the most valuable thing I earned in Newark. Todd, thank you for showing me what it means to get things done. Michele, I wish everybody believed in me as you do. Kate, there never was a better roommate: I bike better, eat better, and live better than I did before we began splitting a rent check.

I give thanks also to the support of old friends. Joseph, many of the ideas contained in these pages first took hold during conversations we've had going back over a decade. Nathan, there are many places throughout the dissertation where I'd think, "Nate would want a little more information here. And he'd be right." Amy, I (we) deeply appreciate your support not only of this project, but of all the others in my (our) life.

Mom and dad, without your love and support I would not have done nearly so much, nearly so well. Matt and Justin, thank you for being such good brothers and friends to me throughout our lives.
Finally, I'll be forever grateful to (and for) the Edlins family. Mariglynn, you are everything I could ever hope for in a best friend. Bergen, you are everything we could ever wish for in a child.
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ABSTRACT

Despite the capacity of air travel to radically transform life on the ground, aerial space is seldom considered a site whose constitutive practices, technologies, and physical forces have indeed reconfigured social, political, economic, and spatial relations — both within and between terrestrial city-regions. This dissertation integrates aeromobility and atmospheric space within a relational mode of urban analysis. It analyzes the processually-unfolding atmospheres of Los Angeles city-regional air passenger traffic.

To do this, it first considers the spatial development of the Los Angeles city-regional airport system as a functional assemblage within nested, overlapping, and aerial-enabled relationships among city-regional infrastructures and institutions. It traces the production of urban forms and processes most directly related with the commercial airline activity centered on LAX and neighboring airports, which relationally configure the Los Angeles city-region, both within and throughout global air traffic networks. This analysis finds, among other things, that LAX has undergone a shift towards transpacific linkages. Future growth in these markets suggests the airport must accommodate larger aircraft and more intensive passenger flows.

The project then describes how one protracted struggle over the reuse by Orange County of a decommissioned military air base can help us understand more fully that aerial spatial production is informed not only by political or economic interests, including demands for more a more even distribution of intensifying LAX air traffic throughout LA city-regional facilities, either operational or dormant. The
project finds that, despite these regional demands, aerial spatial production becomes constrained and enabled to certain degrees by the materiality of air and air travel, including the topographical context of existing airport sites, the configuration and condition of runways, prevailing wind or weather patterns, the presence of aerial flows involving nearby airports, and the physical laws governing flight itself.

Within this discussion, the dissertation considers some of the major institutional practices and arrangements that have assembled the Los Angeles city-regional airport system as a site of “intersection between network topologies and territorial legacies” (Amin, 2007; 103). The analysis suggests that forms of political resistance to airport expansion and construction — which often appeal to improving how airport neighbors dwell-on-the-earth — can become strengthened by integrating appeals to improving how passengers and pilots dwell-in-the-air. The research contributes to an understanding of urban space and governance, particularly of how aerial-related institutions and actors constitute the city both as territorially-bounded node and relationally-articulated network.
Chapter 1

INTRODUCTION AND BACKGROUND

The global economic system would disintegrate without routine transfers of people and goods across long distances. Contemporary modes for doing so have given rise to structures of interurban exchange, which have in turn reconfigured the functions and relations within and between participating cities. Historically, exchange relationships have developed according to the logic of surface travel, either over water (by river, lake, or oceancraft) or ground (by road or railway vehicle). For over six decades, however, global economic exchange relationships have gradually conformed to the spaces and rhythms of air travel. Indeed, many interregional and international relationships might not exist apart from the competitive advantages offered by travel via the vertical dimension, including its relative convenience and affordability.

From its advent in 1903, travel by heavier-than-air aircraft quickly supplanted other long-distance options, needing only five decades to gain currency over the popular cross-country and transoceanic modes of the day, particularly those available for travel across and between the United States and Europe. Beginning in the 1950s, for example, more passengers traversed the Atlantic by air than by sea; also during that decade, more traversed the United States by plane than by rail (Bowen, 2010; 2). More recent points of comparison demonstrate air travel's profound dominance of transoceanic and transcontinental passenger travel. Transoceanic travel, for example, is today virtually nonexistent; as of 2012, only a single ocean liner remains in service.\(^1\) Personal-vehicle use has displaced rail travel as the primary means for overland

\(^1\) The last remaining ocean liner was christened *Queen Mary 2* in 2003, and is operated by Cunard Line, a subsidiary of Carnival Cruise Lines. Though cruise ships have become a common
passenger travel across the United States. Nonetheless, according to the most recent Department of Transportation Household Travel Survey, air travel accounted for more than half of all one-way trips between 750–999 miles, nearly 66-percent of all such trips between 1,000–1,499 miles, and over 80-percent of those 1,500 miles or longer (BTS 2006).\(^2\) The functions of a city develop according to its relationships with other cities in a network-based urban hierarchy (Neal 2011). In previous eras, these interurban exchange relationships depended in large part upon surface connectivity, whether overland,\(^3\) waterborne,\(^4\) or both.\(^5\)

Though surface-enabled urban hierarchies still obtain to a large extent, aerial connectivity has transformed urban hierarchies at all scales, often in dramatic and unexpected ways. The location of Atlanta at the intersection of north-south and east-west freight rail networks once positioned the city atop the urban hierarchy of the Southeastern United States. Among the Southern cities within this hierarchy, Birmingham, Alabama, proved to be Atlanta's nearest competitor: as recently as 1950, both the regional status and urban population of Birmingham

\(\underline{\text{mode of oceangoing, they serve primarily to entertain, as opposed to the primary transport role of ocean liners.}}\)

\(\underline{\text{Compare with the percentage of all one-way trips using personal vehicles: 42.3\text{-percent between 750–999 miles, 31.5\text{-percent between 1,000–1,499 miles, and just 14.8\text{-percent for trips exceeding 1,500 miles one-way (BTS 2006). Train travel accounts for less than 1\text{-percent of all trips in each of the three one-way distance categories.}}}}\)

\(\underline{\text{Beijing, for example, first developed as a stopping point along north-south trade routes. It grew to become the political, cultural, and commercial center of the Chinese empire for most of the past millennium. Beijing was the largest city in the world for many centuries until surpassed by Industrial Revolution-Era London in the mid-1800s.}}\)

\(\underline{\text{By 1800, London had grown to become the largest city in Europe, owing to its position as seat of the United Kingdom's vast maritime empire.}}\)

\(\underline{\text{Constantinople, for example, was the largest city in the world in 1700. It sits at the intersection of trade routes, both overland — between Europe and Asia, as well as between the Mediterranean and Black Seas.}}\)

\(2\)
rivaled those of Atlanta. During the intervening decades, however, Atlanta leveraged its aerial connectivity to leapfrog the urban hierarchy of its immediate regional competitors. The airport now known as Hartsfield-Jackson Atlanta International was already among the busiest domestic airports by the late-1950s — an outcome of the city's axial position within the eastern half of North America: Atlanta is between 600 and 750 miles by air from a widely-dispersed array of major cities, including Chicago, Miami, Detroit, Kansas City, Houston, Dallas, Toronto, and New York (in ascending order of approximate distance). This locational advantage contributed to the growth of Delta and (the now defunct) Eastern Air Lines, two legacy carriers that began an operational focus on Atlanta as early as the 1930s. From its inception, planners, policymakers, and airline decision-makers have leveraged Atlanta's position within national (and, later, international) urban hierarchies, enabling the city to transcend its status within networks of local surface connectivity, and elevating it as a central hub within globe-spanning networks of interurban exchange.

Atlanta has enjoyed its locational advantage despite successive waves of aircraft innovations, each of which has allowed passenger planes to carry more people over longer distances, often while increasing fuel efficiency. Significant improvements in the design of any one of these three — seating capacity, range, or fuel efficiency — has the potential to disrupt extant airline network structures. Over the past several decades, for example, manufacturers have gradually expanded the nonstop range of passenger aircraft. This has allowed inland domestic hubs, such as Denver, to compete for international hub traffic with coastal gateway airports, such

6 US Census boundaries have changed over the decades, making comparison difficult. Nonetheless, the Census-defined urban area for Birmingham contained a population of 445,000 in 1950 and 749,000 in 2010. The similarly-defined urban area for Atlanta contained a population of 507,000 in 1950 and 4,515,000 in 2010.

7 The scale of the airport's operations are staggering. In the past year, for instance, the facility has processed over 100 flights and 10,000 passengers per hour.
as San Francisco. With their most recent generation of passenger aircraft, manufacturers Boeing and Airbus have increased seating capacities without sacrificing fuel efficiency, enabling carriers to overfly once-busy hubs in favor of point-to-point routes between only the largest, most profitable markets.

Innovations in aircraft design stir innovations in network design. The improved capabilities of passenger aircraft — along with the sheer absence of costly physical infrastructure between airports themselves — allows carriers to be more responsive to fluctuations in demand. The global economic system increasingly favors mobility and flexibility, particularly of production strategies, supply chains, capital flows, and the workforce itself. The air travel industry evolves in concert with the logistical demands of the globalized economy. While the air carriers stitch together a vast network of “distant elsewheres” (Graham, 2002; 1), the airports support seamless transfers — between connecting flights, as well as between passenger aircraft and the surface connections extending throughout the outlying city-region.

Passenger travel throughout the vertical dimension has thus emerged in reflexive interaction with the global economy; the functioning of one has become central to that of the other. This interactivity plays a major role in shaping the social, political, and economic functions of city-regions, as well as their spatial organization. As nodes for accessing the vertical dimension, airports situate their surrounding city-regions within urban hierarchies at multiple, overlapping scales of political and economic organization: local, regional, national, and international. As the Atlanta example demonstrates, air travel has created exchange relationships between city-regions where existing modes of surface-based travel proved difficult, costly, or impossible. Once established, these aerial-networked relationships have in turn become transformed by innovations in aircraft design, which tend to benefit carrier flexibility over the stability of routes (and, by extension, the network stability of cities linked by these routes). The fixity of airport infrastructure, too, helps situate a variety of commercial and industrial activity within adjacent urban spaces, as the spatial forms and social processes of city-regions integrate
with the practices of aeromobility and its associated speeds, sounds, and material spatial practices. This integration comes at a cost, as airports also become sites “of destabilization, ambiguity, and constant movement” (Lisle, 2003; 4), whose harmful effects on social life often transcend territory, place, and scale.

Despite the capacity of air travel to transform life on the ground, however, neither the urban planning nor policy literature — nor the broader public, for that matter — have adequately considered aerial space as a site whose constitutive practices, technologies, and physical forces have indeed reconfigured social, political, economic, and spatial relations — both within and between terrestrial city-regions. The activities taking place within this vertical dimension promise only to become more complex over the coming era, for at least three reasons. First, burgeoning middle classes and improved access to air travel in countries such as China and India have begun fueling a broader global demand for business and tourist aeromobilities. Second, airports are undergoing a wave of competitive renovation in order to attract or maintain service by air carriers whose fleets have gradually integrated a new generation of outsized “superjumbo” aircraft, designed for use especially along the busiest, most profitable international routes. Third, a host of urban actors continue to deploy unmanned aerial vehicles (UAVs, or drones) in service to a broad range of functions, including policing and surveillance, border patrol, film production, firefighting, cargo transport or delivery, poaching enforcement, recreation, video journalism, and various forms of site survey, including agricultural, archaeological, construction, and meteorological. Other potential applications for unmanned vehicles, such as highrise construction in dense urban environments or home delivery services, are still in early stages of development. This increasing complexity presents a challenge for policy researchers and urban planners, alike, who have only recently begun to recognize aerial space as a realm of urban activity which offers a distinct set of problems and possibilities for the governance and forecasting of urban systems. We cannot hope for a better understanding of urban space, in general, nor aspire to more preferable social futures, without also developing a better
understanding of how the aerial space of cities is produced and reproduced — of how it is
occupied and controlled. “[O]ur relationship with aeromobilities is deeply political,” claim
Cwerner, Kesselring, and Urry. “And, without knowing what lies above us, we have little scope
for bringing it under democratic control” (2009; x; original emphasis). Urban policy research and
analysis has thus far considered urbanization insofar as it takes place on the terrestrial surface.
Planners and policy-makers require a better understanding of the condition and dynamics of
urban aerial space, particularly as it orders and positions social, political, and economic relations
of networked city-regions.

Los Angeles exemplifies the increasingly complex aerial realm better, perhaps, than any
other North American city-region. For over a century, dynamic arrangements of local, national,
and global actors have pursued development strategies for Los Angeles that have embedded its
territorial functions within a correlate region, emergent from the dialectical interaction between
aerial-related social process and aerial-related spatial form — an aerial sociospatiality (Soja,
1989). I refer to this aerial sociospatiality using the term aeriality. I intend for this dissertation to
outline a general vocabulary that allows us to better map urban-regional spaces and policies in
relation to the forms and processes enabled by the production of aerial space, with a particular
emphasis on the spaces and policies of commercial passenger aeromobility.8

Urban policymakers, including local and national state-actors, supra-national bodies, as
well as executives from the airlines and related industries, have become the primary authors of
global aeromobility and the urban aeriality to which it contributes. Rather than assuming an
abstract set of “political forces” that takes place within jurisdictional boundaries, my
understanding of the city-region — and therefore of their aerial components — is best defined by
Allen and Cochrane, who conceive of the urban region “an assemblage of central, regional, and

8 By aeromobility, I echo Adey et al. (2007; 774), who use the term “to refer to the dominance of
flying as the normal international mode of travelling.”
local actors engaged in a complex set of political mobilizations at one point in time...all...part
and parcel of a 'regional' assemblage of political power that is defined by its practices, not by
some predetermined scalar arrangement of power” (2007, 1171). This is a processual
understanding of the region: the performance of the city (how it unfolds, and by whom) trumps
its given territorial limits. The assemblage of actors expressed within, and comprising, the
aeriality of Los Angeles have tied its city-regional economic development since the early-1900s
to the occupation and production of aerial space, initially as a center for the manufacture and
operation of military aircraft and more recently as a center within international aeromobility
networks as the primary North American entry-point for transpacific cargo and passenger air
traffic. It is this latter aspect of Los Angeles aeriality which I hope to understand more fully.

With this dissertation, I examine and map the aerial region produced by, and productive
of, the Los Angeles city-region and its global hinterworld (Taylor, 2001; Taylor and Walker,
2004). I ask a set of questions that will improve our understanding of how aerial space relates
with the condition, functions, and dynamic of the Los Angeles city-region:

1. How have passenger air-traffic linkages relationally-configured the Los Angeles
city-region? Aerial space allows connectivity within horizontal networks of
external city-regions. What is the nature of this connectivity and what are its
implications for urban terrestrial space and institutions of governance? What
institutions and actors have managed and authorized these aerial configurations?

2. How has aerial spatial production been terrestrially-situated within the Los
Angeles city-region? In what ways and through what use is this terrestrial
configuration related to the condition, development, and dynamics of the city-
region? What institutions and actors have managed and authorized these terrestrial
configurations?

3. What are the implications of aeriality for policy, analysis, and theory? How does
aeriality allow us to better understand the condition and dynamic of Los Angeles
in relation to other city-regions? How might this approach help us better
understand other city-regions?
Together, these research questions will allow me to say something about the extra-regional aeromobility space for Los Angeles, including its extent, its development, and what it means and has meant for the terrestrial region.

Since its unofficial inception at the Los Angeles International Air Meet in 1910, the aerial footprint of Los Angeles has undergone several rounds of radical reconfiguration. Each successive round of change has articulated Los Angeles city-regional interests — at ever-greater speeds, and at ever-larger scales — throughout the shifting network of its sociospatial relations (Harvey, 1978). My intention with this research is to illustrate not only that the aerial relations of Los Angeles merely happen in space but, rather, to illustrate that “where things happen” plays a critical role in the relational construction of the city-region (Warf and Arias, 2009; 1; original emphasis). Moreover, I intend to examine the configuration of airports' grounded forms and processes, particularly as it relates to how these facilities enable (or hinder) the production of aerial space within a city-regional system.

The project to this point has outlined the problem and research questions. It continues below, first by defining the conceptual framework: introducing and describing what is meant by terms like the relational or aerial construction of urban space. Finally, the chapter concludes with a definition of the spatial focus of the project and an overview of how the discussion is organized.
Defining a Relational Urbanism

Law II. The alteration of motion is ever proportional to the motive force impressed.

Law III. To every action there is always opposed an equal reaction.

(Newton, 1687/1846; 83)

The exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind.

(Article 1, Outer Space Treaty\(^9\), 1967)

Imagine a wing within a volume of air. If we pass the wing through the air, it exerts a force as it moves, causing the air to stir: some air passes over the wing; some beneath. According to Newton's Third Law of Motion, the force of this reaction by the air is equal to that of the wing (Newton, 1687/1846; 83). Owing to its teardrop shape, the wing acts upon the air with a downwards force, and air upon the wing with an upwards force.

The shape of the wing is what enables the reaction here. Passing just any squared-off wooden plank through the air would generate a similar equal-and-opposite reaction, but the upwards force of the air on the plank would be insufficient to counter the force of drag, often called air- or wind-resistance.

But if we were to form the plank's leading edge to a round shoulder and its trailing edge to a sharper point, we would feel the air reacting upwards on the plank in greater proportion to the plank acting downwards on the air. We call this greater proportion lift.

\(^9\) Officially the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies
If the wing is propelled forward relative to the air, lift enables it to fly.

***

Now, imagine the Earth and an object in flight around it. The force of gravity pulls the object towards earth. The propelled object maintains its tangential path only through opposing the downwards pull of gravity with an equal reaction (Newton, 1687/1846; 83). We call this oppositional force orbital velocity. An object achieves orbital velocity the moment its force of velocity around the Earth exceeds the force of gravity pulling it towards the Earth. This moment varies with altitude: the influence of gravity upon the object diminishes as the distance grows between the object and earth.

If the object maintains this orbital velocity in equal opposition to the force of gravity, it has achieved a circular orbit: essentially, a sideways free-fall whose circular path conforms to the area of outer-space just beyond the effects on the orbiting object of Earth's (roughly) spherical gravitational field.

All atmospheric phenomena (those having mass, anyway) must also conform to the influence of this gradually-diminishing spherical field, whose dynamism keeps pilots and meteorologists on their toes. As with other natural systems, gravity is never static. As an object in flight gains altitude above the Earth, for instance, air molecules become sparser. The thinner air reacts less forcefully against the object's wings, generating less lift the higher it flies. The object must therefore move through the air with greater and greater velocity in order to generate enough lift to oppose the weakening (though nonetheless ever-present) force of gravity. At a certain altitude, the object can accomplish this only by traveling faster than the speed of orbital velocity — at that instant, it crosses the threshold between flight and orbit. Where (and when) the object crosses this threshold above the Earth is entirely contingent upon atmospheric conditions,
including air temperature, air pressure, and gravitational pull. Add to this contingent mix of factors the fact that the earth below is it itself in motion: its uneven, continuously-rotating surface exerting an uneven force of gravity on nearby objects. The ever-shifting threshold between flight and orbit is known as the Kármán Line, after astrophysicist Theodore von Kármán.

Policy-makers, physicists, and cartographers often demarcate Earth's atmosphere from outer-space\(^{10}\) using 100-kilometers in altitude (62 miles) as a standard approximate for this Kármán Line. The international governing body for aeronautical records and measures, \textit{La Fédération Aéronautique Internationale} (FAI), for example, recognizes outer space according to this proxy. But the actual instance of the Kármán Line takes place not as a fixed point in the atmosphere but rather as an event within the unfolding relationship between social process and spatial form; it exists as the interplay of forces which determine the moment at which an aircraft must cross a certain performance threshold in order to remain in flight. The instant an object in flight stays in flight only by exceeding the orbital velocity at its given altitude, it has entered outer-space. This boundary event, which occurs between one's experience of inner- and outer-space, is thus composed entirely of a change in the quality of aerial-spatial production. In practice, there is no quantitatively-defined border separating the two.

The plasticity of this boundary has likely prevented its adoption by the United Nations and other international organizations for use within transnational agreements governing or otherwise regulating outer-space. Such agreements often require the international community to regulate activities with reference to a bordered zone. But we simply cannot pin-down where the experience of inner-space shifts to one of outer-space. The most comprehensive of outer-spatial

\(^{10}\) To avoid confusion over the word \textit{space}, I will only ever refer to \textit{outer-space} as \textit{outer-space}. Outer-space is but one dimension of space yet, for some reason, that's enough for us to sometimes think of it as the only space we've got. Clearly, it isn't.
governance frameworks, for instance, fails to definitively outline the space to, or within, which it applies. The so-called *Outer Space Treaty* of 1967 established an international regulatory framework concerning “the activities of states in the exploration and use of outer space” (United Nations Resolution 2222 (XXI). It does not, however, explicitly demarcate outer-space. The treaty comes closest to doing so in Article IV, which forbids participating states from placing “in orbit around the earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction” (United Nations Resolution 2222 (XXI), emphasis added). The vague language “in orbit around the earth” must sound especially vague to the physicist, who likely understands that even a bullet fired horizontally several feet above the ground travels “in orbit around the earth” until pulled groundwards in a slight arc, as gravity overtakes the orbital velocity of the bullet. The treaty's ambiguous bordering of outer-space is especially remarkable considering its development and ratification during an era of intensified border transgression and conflict, both territorial and discursive (e.g., the Indo-Pakistani War of 1965, the Arab-Israeli of 1967, Cold War-related conflicts such as the war in Vietnam from 1955 to 1975, and large scale social movements, including the Civil Rights Movement, the Gay Rights Movement, and the Sexual Revolution).  

Somewhat ironically, the Kármán Line uses the absolute terms of classical mechanics to describe a border in constant spatial flux. The *Outer Space Treaty*, on the other hand, has the effect of a casual gesture in the direction of outer-space, as it declares the entire expanse “the province of all mankind” (Article 1). The treaty establishes a foundation for international law

---

11 For its part, the United States supported the treaty, primarily as a method for checking perceived Soviet ambitions in outer space. The USSR, for example, was the first nation to launch a satellite into orbit (*Sputnik*, in October 1957). Months prior to this event, the United States proposed an international program for verifying the purpose of such objects. Though the Soviet Union initially rejected a verification program, the proposal eventually led to an agreement between the two countries, forming the basis for what would become the Outer Space Treaty (State Department of the United States, n.d.).
without ever explicitly distinguishing the transnational province of outer-space from the inner-space of territorially-defined, state-driven aerial governance. Both modes of demarcation present us with indistinct boundaries between here and there — between inner- and outer-space.

Indistinct boundaries such as these demand we consider and analyze their performance using a vocabulary of relationality: instead of talking about space as a container within which people and objects interact (e.g., at the intersection of the x and y coordinates within a Cartesian grid), we must build alternative frameworks to help us understand how space is produced through interactions among people and objects. We must therefore discuss urbanization not only with reference to the territorially-defined formations of people and objects — cities, suburbs, edge cities, countryside — but also to the correlative, differentiated processes embedded within networks of relational processes that transcend scale, place, and territory:

Cities are affected by events and transactions well beyond their corporate boundaries. Reciprocally, they produce external effects that are positive and negative for other communities. Cities may rely upon resources from as far as another continent. Some scholars make the argument that cities, as polities exercising public authority, are less and less able to effectively control the state of affairs within their own boundaries. Yet, we have few concepts and no agreed upon language that allows us to systematically deal with these and other issues related to the boundary conditions of cities from a policy analysis perspective. (Warren and Weschler, 1976; 110-111)

Manuel Castells' conception of urbanization provides us with a basis for just such a framework. In The Urban Question (1977), he recasts our concept of urbanization to mean “the social production of spatial forms” (17; original emphasis): a redescription that on one hand incorporates the process by which “activities and populations” gather within a limited spatial form, and on the other, the process by which these social formations reproduce and diffuse a corresponding cultural content (15). The spatial form of the city is thus in constant dialogue

12 The Greek prefix dia- means “across,” not “two” (that would be di-, as in “carbon dioxide”). Dialogue instead comes to us from the Greek dialogos, a word combining dia-, “across,” with legein, “speak.”
with the activities and dwelling patterns of its gathered population, as well as those of communities interlinked to it via networks of exchange. Castells argues that the process of urbanization is closely integrated with the historical process of capitalist development, according to which social structures transform “in such a way as to free a capacity for gradual [capital] accumulation” (19). This mode of development reconfigures social formations, but always in relation to those social formations linked to it via asymmetrical, dependent relations of exchange, whose expansion at all scales produces “a new geographic configuration that can better accommodate the powerful expansionary, conflictual, and technological dynamic of a restless, shifting capital flow” (Harvey, 2001; 338\textsuperscript{13}).

Though oppositional movements have successfully resisted transformations within the local place of city-regions, this place-based resistance to the current mode of capitalist urbanization has become “all too often subject to the power of capital over the co-ordination of universal fragmented space” (Harvey, 1989; 238-239). Oppositional movements that successfully negotiate merely local transformation often do so at the expense of the struggle for a radically inclusive global politics: “in clinging, often of necessity, to a place-bound identity […] oppositional movements become a part of the very fragmentation which a mobile capitalist and flexible accumulation can feed upon” (303). One strategy for renewing this mode of local opposition is for us redefine places so that we understand them not only as territorially-bound localities but “as articulated moments in networks of social relations and understandings” — that places give form to process (Massey, 1993; 66; see also Graham & Healey, 1999; 11).

Reconceiving of urbanization as the social production of spatial forms thus reveals “the boundary conditions of cities” (Warren and Weschler, 1976; 111) to be as fuzzy and ideological as the boundary conditions of inner- and outer-space. If we wish to successfully oppose or

\textsuperscript{13} cf. Harvey, 1978; 1982; ch. 13.
otherwise inform contemporary forms of capitalist urbanization, we must conceptualize our places and communities not merely in terms of territory but also — far more importantly — in terms of how they gather, or relate, people and objects.

To do this, we must become as conscious of the external interactions which enable the social production of spatial forms for a particular city-region as we have become of those interactions which the city-region concentrates or gathers (Massey, 1993; 66). The most visible manifestations of these external interactions relate to mobility infrastructures and technologies. As the chief instrument of “time-space compression” (Harvey, 1989), mobility systems have become central to global processes of capitalist urbanization. How groups access mobility systems not only shapes their experience of urban space but the way others experience it as well: “differential mobility empowerments reflect structures and hierarchies of power and position by race, gender, age and class, ranging from the local to the global” (Tesfahuney, 1998; 501; quoted in Hannam et al., 2006; 3). In many cases we can read the landscapes of mobility as intentionally reproductive of particular regimes of power and control. Technology critic Langdon Winner cites New York City's master builder Robert Moses, who in the mid-20th-century demanded roadway overpasses in many parts of the city be built high enough to allow passage for predominantly white automobile-owners yet low enough to restrict passage for twelve-foot-tall buses and their predominantly black, predominantly low-income ridership (Winner, 1986). Moses intended for the overpasses to function as passive border checkpoints, producing a racialized space which allowed “whites privileged access to opportunities for social inclusion and upward mobility [while at the same time imposing] unfair and unjust forms of exploitation and exclusion on aggrieved communities of color” (Lipsitz, 2011; 6). But presence of intent is seldom the rule:

the most important examples of technologies that have political consequences are those that transcend the simple categories “intended” and “unintended” altogether. These are instances in which the very process of technical development is so thoroughly biased in a particular direction that it regularly produces results heralded as wonderful breakthroughs by some social interests and crushing setbacks by others. (Winner, 1986; 25–26)
As the primary mode by which urbanization takes shape within and between airport-enabled city-regions, commercial air-passenger travel has become instrumental to the performance of the contemporary global order, particularly the expansion of a global capitalist economy (Urry, 2009; 30). As with Moses' overpasses, air travel has constructed “(relatively) secluded space across the world along the connecting lines of the space of flows” (Castells, 1996, 417).

Commercial passenger air travel comprises a set of social processes that have produced radically expanded, mobile forms of urban life for some groups and correspondingly isolating, oppressive forms for others. The (re)development and expansion of mobility systems within the Los Angeles city-region over the past half-century has intensified its relations within global exchange networks that coordinate and synchronize the lives of urban dwellers at multiple, overlapping scales. The effects of these intensified relations produce economic and environmental security for those able (and authorized) to make use of it, and corresponding insecurities for those whose sleep it interrupts, whose air it pollutes, and whose quality of life has been undermined in countless other ways by passenger air travel.

My purpose with this research is to integrate aeromobility and atmospheric space within this relational mode of urban analysis. In the chapters that follow, I analyze the processually-unfolding atmospheres of Los Angeles city-regional air passenger traffic. My analysis suggests that forms of political resistance to airport expansion and construction — which often appeal to improving how airport neighbors dwell-on-the-earth — can become strengthened by integrating appeals to improving how passengers and pilots dwell-in-the-air. This research contributes to an understanding of urban space and governance, particularly of how aerial-related institutions and actors constitute the city both as territorially-bounded node and relationally-articulated network.

I see this project as integral to developing a progressive sense of place, helping to uncover the, real relations with real content — economic, political, cultural — between any local place and the wider world in which it is set. In economic geography the argument has long been accepted that it is not possible to understand the ‘inner city,' for instance its loss of jobs, the decline of manufacturing employment there,
by looking only at the inner city. Any adequate explanation has to set the inner city in its wider geographical context. (Massey, 1991; 27)

To do this, I first consider the spatial development of the Los Angeles city-regional airport system as a functional assemblage of “the necessary spatial, infrastructural, and institutional moorings that configure and enable mobilities” (Hannam et al., 2006; 5). I conceptualize aerial sociospatiality — what I call *aeriality* — using a mapping-informed, spatial-analytic approach directed at the production of aerial space by the Los Angeles city-region. Adey's (2010) use of the term *aereality* to describe “a distinctive kind of mobile society...which the aeroplane has worked to imagine, define, and mould” (8) plays off the connotations invoked by its root: *reality*. In my use of *aeriality*, I want to invoke not only something like “the quality or state of being in the air” but also, more importantly, the socially-produced quality of aerial space(s). In this sense, I want to play off the Lefebvrean/Sojan conceptualization of *spatiality* to mean “socially-produced space.” In my conceptualization of aeriality, I trace the production of urban forms and processes most directly related with the commercial airline activity centered on LAX and neighboring airports, which relationally configure the Los Angeles city-region — both as intensified node and extended web — within and throughout global air traffic networks. I then describe how one protracted struggle over the reuse by Orange County of a decommissioned military air base can help us understand more fully that aerial spatial production is informed not only by political or economic interests (e.g., NIMBY activists versus prospective airport operators), but also becomes constrained and enabled to certain degrees by the materiality of air and air travel, including the topographical context of existing airport sites, the configuration and condition of runways, prevailing wind or weather patterns, the presence of aerial flows involving nearby airports, and the physical laws governing flight itself. Within this discussion, I consider some of the major institutional practices and arrangements that have assembled the Los Angeles city-regional airport system as a site of “intersection between network topologies and territorial
legacies” (Amin, 2007; 103). First, though, we must trace the contours of the Los Angeles city-region's historical relation with aeromobility and aerial spatial production.

**Defining an Aerial Urbanism**

For eleven days in January of 1910, Los Angeles hosted the first major air show in North America. The Los Angeles International Air Meet offered the almost 200,000 spectators who flocked to Dominguez Field their first opportunity to see airplanes in action, as dozens of pilots set and reset records of speed, altitude, and distance. Most of the maneuvers these pioneering aviators performed seem routine by contemporary standards; many, for example, involved attempts at staying aloft for as many minutes as each could muster — no small feat considering that only a few years earlier the most successful pilots were the few who managed to leave the ground in the first place.

Government officials and business leaders in the newly air-minded city quickly recognized the commercial potential of powered-flight for their region. The day after the close of the air show, the editors of the *Los Angeles Herald* urged their Southern California readership to take seriously the “mysterious science” of aviation, calling the event, the great historical meeting which taught the world not merely that it could fly, but that the ships of the air, like the ships of the sea, could carry letters, packages, freight, and passengers... (Los Angeles Herald, 1910)

The editors' optimism over the commercial potential of aviation failed to mention its already realized military applications. Not five years after their first heavier-than-air flight — two years before the Los Angeles Air Meet — the Wright brothers had begun negotiating the financial terms under which they would deliver fleets of aircraft to those governments of the world, “keenly alive to the usefulness of the aeroplane in time of war” (New York Times, 1908).

The Los Angeles Air Meet thus sketched for an awestruck public the sober conclusions already drawn by the governments of the world: that heavier-than-air flying machines would continue to give rise to new subjectivities, vulnerabilities, and affordances within the social
realm. German philosopher Peter Sloterdijk uses the term *explication* to refer to “the revealing-inclusion of the background givens,” which occurs, for example, as atmospheric phenomena — including gases, meteorology, and conceptions of volumetric space — become more tightly integrated within our foregrounded modes of terrestrial life (2009; 9). This is not necessarily a welcome development. In *Terror from the Air*, Sloterdijk observes that the 20th-century was an “age whose essential thought consisted in targeting no longer the body, but the enemy's environment” (14), most significantly through the revelatory power of new, *atmotechnic* weapons and tactics, “which expose — in the mode of a bad surprise — new surfaces of vulnerability” (28). In warfare, these emergent forms of atmotechnicism worked by transforming “the human being's immediate environment…into something whose intactness or non-intactness is henceforth a question” (25). Sloterdijk constructs his analysis around the environmental terrors produced through *designed* atmospheres. His starting point is the first large-scale use of gas warfare by the German military in 1915, the knowledge-base for which later enabled the German chemical industry to develop modern pesticides throughout the 1920s before eventually facilitating the German state's systematic extermination of human beings.

Sloterdijk later considers the atmotechnic innovations used to explicate and expose “new surfaces of vulnerability” by way of occupied — or, as he calls them, *unfolded* — atmospheres, including the conduct of aerial surveillance, air raids, carpet-bombing, precision air strikes, and airborne infantry operations. Though the Los Angeles Air Meet never explicitly demonstrated the airplane's military potential, French pilot Louis Paulhan, during a flight around the city of San Pedro, circled his biplane above Fort MacArthur, a longstanding harbor-defense position for which the United States military had only the previous day purchased additional land for a coastal-defense artillery battery. A *Los Angeles Herald* reporter observed the pilot's incidental seizure of the high-'ground' from the mammoth artillery emplacement below, noting that Paulhan “demonstrated that though guns may cast a projectile many miles, nothing shall prevent the conquerers of the air from sacking cities from a point of vantage on high” (Olympus, 1910). It
would not take long before Paulhan’s performance received violent reinterpretation on an actual field of battle: in November of the following year, Italian military pilot Giulio Cavotti dropped four two-kilo bombs from his monoplane onto an enemy encampment in Tunisia (Lindqvist, 2000). It had taken just under eight years for the technology behind Orville Wright’s 12-second flight in 1903 to be transformed into a platform for military violence. It would take only two decades more for the Los Angeles city-region to become the greatest agglomeration of military aircraft manufacturing and development anywhere in the world.

The pilots, manufacturers, investors, and local leaders who organized and participated in the Los Angeles International Air Meet tilled the aerial terrain from which sprouted and spread the economic, political, and social relations of twentieth-century Los Angeles. The performances and accounts from those eleven days expressed a municipal optimism over the potential for aerial-spatial production to transform the city, first by extending its boundaries to encompass a relationally-constructed region, produced and accessible via aerial linkages, and second by enabling the intensified development around airports, the new terrestrial forms enabling aerial connectivity. The scale of aerial-spatial production centered on, or involving, Los Angeles would soon enact massive transformations upon the city-regional economy, developing its manufacturing base, reconfiguring its institutions of governance, and building research and development capacity at regional universities. The explosive growth in aerial-spatial production has also restructured the built environment within both the urban core of Los Angeles as well as its periphery, most visibly through the construction and expansion of numerous military and civilian airports, including their attendant zones of intensified extraregional mobility, surrounding clusters of commercial or industrial activity, as well as the more diffuse effects of roadway congestion, noise, and air pollution.

14 By way of comparison, the submarine was first constructed in 1620 and first militarized in 1775, a full 155 years later.
Cities and the everyday lives of their inhabitants have always been affected by the presence, condition, and dynamics of the atmosphere. To dwell as a human is to live as a “being-in-the-air” (Sloterdijk, 2009). This relationship between everyday life and the atmosphere is physiological; our bodies depend on breathable air that is free from harmful gases, particles, and pathogens. It is deeply embedded within our shared cultural experiences; the short-, long-term, and cyclical changes in atmospheric state — what we commonly call weather, climate, and the seasons — are fundamental to what we wear and eat, where we shelter, and how we mark time. Indeed, our entire experience and demarcation of time is rooted in the atmosphere and the changes it entails for terrestrial phenomena. Until the early-1800s, the relationship between the atmosphere and the everyday lives of urban dwellers remained a largely one-sided affair. Since that time, however, humans have reciprocated in earnest, most conspicuously by emitting carbon into the atmosphere through fossil fuel consumption, which in turn feeds back into terrestrial life, both human and non-human.

Catalyzed by the aeronautical innovations of the early-1900s — including those on display at the Los Angeles Air Meet — public and private interests within city-regions began to embed terrestrial social functions within the newly-accessible atmospheric envelope.\(^{15}\) The production and occupation of urban aerial space enables public institutions and private actors within city-regions to aerosolize a range of once exclusively terrestrial social functions, creating novel forms of human experience, interaction, and control (Adey, 2010). We govern and are governed through the atmosphere as a site of state activity, including police, military and firefighting operations, aerial surveillance, and the movement of political elites and state detainees. We transport ourselves and objects through the atmosphere using various types of airborne equipment, for purposes that include business, advertising, religious pilgrimage, religious pilgrimage,

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\(^{15}\) Whenever I attribute action to a place — in this case, Los Angeles — it is because I understand place as process.
tourism, recreation, aeromedical evacuation, entertainment, and the application of agricultural materials. But these and other social purposes taking place within the atmosphere must first take place on the terrestrial surface, which becomes reconfigured through its accommodation of aerial-spatial production. Commercial passenger aeromobility, for instance, requires vast assemblages of grounded infrastructure, centered upon the airport facility and extending outwards in all directions, “sucking highways and rail corridors towards it, re-zoning its surrounding suburbs, flattening houses and changing the geography of the city around it” (Fuller and Harley, 2004; 41). Equally critical to commercial passenger aeromobility are the institutional arrangements that authorize and manage airport facilities and their aerial linkages. And in all cases, the capacity for aerial operations are subject to physical laws governing flight, which often bring into consideration the materiality of an operational envelope, which may include the atmosphere itself, as well as nearby topography, or landforms. Far from incidental to aerial-spatial production, these factors determine not necessarily if a site is able to support aerial operations but, rather, at what volume.

The human capacity for powered flight has given rise to an aerial spatiality which has become “an incredibly complex and differentiated terrain produced by uneven mobilities and immobilities which are continuously intermingling and synchronizing with one another” (Adey et al., 2007; 786). With the widening usage of unmanned aerial vehicles (UAVs) by military and civil authorities, intensified expansion and production of civil airspace in China and India, and the disruption of air traffic by human, geologic, and climatic disruptions over the past decade, aeriality promises to become an increasingly complex and more widely differentiated dimension of urban life. I have designed this research to consider the aerial life of cities as it produces space generally, though I focus on the specifics of but one aspect of aeriality — commercial air-passerenger traffic — and then only as it relates to one city-region in particular — Los Angeles.
Defining the Region

The study area is centered on the Los Angeles city-region. Because regional definition is among the most contentious acts performed within spatial or policy research, the following section briefly outlines how the dissertation defines the region depicted in Figure 1. The base map for the populated area uses National Land Cover Database (NLCD) imagery depicting impervious, or man-made, surface cover within the United States. In the map, this imagery shows up as clusters of red pixels, shaded according to the estimated percentage of impervious surface cover within a 30-square-meter area. The built environment is generally impervious; whereas the natural, or unbuilt, environment generally allows rainwater or meltwater to infiltrate its surface. The red pixels provide us with an impression of development as it is actually experienced by urban dwellers on the Earth’s surface, which generally conforms to the built environment. The NLCD data therefore offers a general impression of the space created by terrestrial urban activity, which usually takes place within buildings or upon paved surfaces. Other approaches that represent urban settlements as bounded political units often provide incomplete depictions of the distribution of urban dwellers and urban social processes within these political boundaries.
Figure 1  Regional definition. The buffer (light green areas) and urbanized areas (red areas outlined in white) containing the Los Angeles city-regional and its central commercial passenger airports.

This NLCD imagery is then overlaid with boundary data for US Census Bureau-designated ‘urbanized areas,’ defined by the Bureau as “densely settled territory that contains 50,000 or more people” (United States Census website, 2011). The map uses a thin white line to outline the urbanized areas I have designated for inclusion within the Los Angeles regional core. While the impervious surface map beneath depicts the distribution of urban dwelling, this Census-defined layer depicts where urban dwelling is most concentrated, organized, and federally-recognized (and therefore politically-constructed). I created 50-kilometer buffer zones...
extending in all directions from the edges of these white-bordered urban cores. The extent of these buffers forms the basis of my study region.

The impervious-surface/urbanized-area basemap and buffer zones is next overlaid with point data from a dataset identifying all federally-recognized airports in the region, representing a range of aviation-related facilities, including airports of any size, helipads on hospitals or oil derricks, and seaplane landing facilities. This data is collected by the Federal Aviation Administration (FAA) and geospatially formatted by the Research and Innovative Technology Administration’s Bureau of Transportation Statistics (RITA/BTS) for their annual National Transportation Atlas (Bureau of Transportation Statistics website, 2011).
Background of Los Angeles

The Los Angeles city-region comprises a major node within the global aeromobility regime, not only for its dense commercial air passenger traffic but also for the history, intensity, and range of its aerial-related urban activities (Figure 2 includes the region along with all of its significant airport facilities).

Figure 2 LA city-region and significant airport facilities

The city's motion picture industry, for instance, has created visions of a future Los Angeles whose relationship with the atmosphere is considerably more intense than at present. Films such
as *Blade Runner* (1982), the *Back to the Future* franchise (particularly *Back to the Future II*, from 1989), and *Total Recall* (1990/2012), all re-imagine the city’s current bramble of terrestrial freeways as an equally illegible knot of airways, brimming to capacity with flying cars. Hanna Barbera studios, based in Santa Barbara, produced *The Jetsons* (1962–63), an animated program that, though never explicitly revealing the physical location of its airborne city, made frequent reference to the sociocultural milieu of Southern California. As home to the six largest film production studios in the world, the Los Angeles city-region remains the center of the motion picture industry, an industry long fascinated by aerial space. Famed aviator Howard Hughes produced and directed *Hell Angels* (1930), one of the earliest sound-enabled blockbuster films. More recently, the highest grossing films from each of the past six years all feature one or more main characters with a natural or acquired capacity for flight.

In addition to imagined aerial activity, the Los Angeles city-region also produces dense volumes of non-commercial air traffic. Van Nuys Airports, located about 25 miles north of LAX on Interstate 405, is the busiest general aviation airport in the United States by aircraft movements, with about 400,000 private, chartered, and recreational take-offs and landings per year. The Los Angeles Police Department operates the largest airborne police fleet in the world. The State of California’s airborne firefighting unit, CAL FIRE, operates “the largest state owned firefighting air fleet, including 23 air tankers, 11 helicopters, and 14 air attack vehicles” (CAL FIRE, 2011). The CAL FIRE program positions many of these airborne assets at airfields throughout the fire-prone Los Angeles city-region. The infamous Los Angeles smog is perhaps

16 The term *blockbuster* itself — now used almost exclusively to describe commercially successful films — was originally applied to a type of highly-explosive bomb used by the British during the Second World War.


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the most recognizable dimension of the city-region's atmospheric presence, often standing-in for Los Angeles much as a skyline might for other cities.

Los Angeles is often held up as an archetypal automotive city (and in many cases the archetype). While freeways and the automobile had a deeper influence on Los Angeles than it did on older, more established cities on the East Coast of the United States, it is also true that Los Angeles developed during the era of powered flight. The city is a massive concentration of airport infrastructure, much of which was built (and in many cases, repurposed) to achieve a wide variety of aeromobile objectives, including as recreational airstrips, military airfields, and passenger airports. Figure 2 features the most significant towered airports in the region. For the purposes of this research, however, I focus only on that portion of the Los Angeles aerial footprint produced by commercial air-passenger traffic, particularly related to the city-region's seven commercial airports. Five of these airports cluster within the region's urbanized core (see Figure 3, following page):

1. Los Angeles International Airport (LAX)
2. LA/Ontario International Airport (ONT)
3. John Wayne Airport (SNA)
4. Bob Hope Airport (BUR)
5. Long Beach (LGB)

Two other commercial airports produce aerial space for the region's periphery:

6. Palm Springs International Airport (PSP)
7. Santa Barbara Municipal Airport (SBA)
Though Los Angeles International Airport handles over 90% of the region's commercial air passengers, the four other airports — along with two other peripheral facilities — perform functions integral to the shape and scalar intensity of the region's overall footprint. The city-region is home to additional airport facilities which, though not offering commercial service, are nonetheless important to the aerial footprint for Los Angeles (see Figure 4, following page). Within the city-regional core, these facilities include two general aviation airports (Van Nuys and San Bernardino International) and two military bases: one operational (Riverside County's March Joint Air Reserve Base), the other decommissioned (Orange County's MCAS El Toro).
The following section briefly describes the data I use to inform my case study of Los Angeles International and the other airports in the city-regional system.

Datasets

My reading of aerial spatial performance relies on two primary passenger airline data sources. The first of these has been generously donated for my use by Innovata, LLC, a company that provides airline schedule and capacity information to the airlines themselves. The second dataset is a patchwork of sources, assembled to provide a continuous and comprehensive look at

Figure 4  Inset of Los Angeles city-regional core.
the changing surface and aerial configurations for each study region over time. The federal passenger-traffic regulatory account for each city begins in the 1920s with the records of the Aeronautics Branch of the Department of Commerce and continues to the present through a series of successor agencies, broken only by a pause of about four years during the Second World War. The records most relevant to my dissertation are the origin-destination surveys, conducted once or twice a year from the 1930s through to the Federal Aviation Act of 1958, which established the Federal Aviation Administration (FAA). The FAA maintained previous agencies' practice of sampling origin-destination surveys before eventually requiring each airline to regularly report a standardized set of information on all passenger and cargo volumes. A version for each of these reports, for every year (except for most of the period between 1941–1945), exists in the publicly-accessible holdings of the Library of Congress. Much of this data for the years 1990 to the present exist online through the Bureau of Transportation Statistics passenger airline search portal.18

**Organizing the Research**

The remainder of this research is organized into five additional chapters. In the next chapter, I summarize and review the literature related to 1) the city as an object of study, 2) measures of interurban exchange, 3) the airport as an urban facility, 4) (aero)mobilities, and 5) Los Angeles as a prototypically postmodern city.

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18 This data has been complemented with the more recent and comprehensive Schedules Reference Service (SRS) dataset, from Innovata, LLC. This dataset consists of seat capacity and flight frequency for direct scheduled flights, and includes data on 900 airlines operating at 10,935 airports worldwide. One of their engineers and I assembled the dataset used herein. We built it to include all available data for commercial airports within my defined regions, which included 41 airports within the area centered on the Los Angeles city-region. Innovata provided me with an output file containing my requested data for the Los Angeles city-region for the period beginning August 2003 and ending July 2011.
The third chapter describes the aerial-region produced by LAX and its neighboring city-regional airport facilities. The chapter opens with some background on the growth of LAX as a site of aerial-spatial production for the region. It then moves to an analysis of LAX linkages over time, which engages with a variety of air traffic data to map the development of aerial linkages between Los Angeles and other city-regions, domestic and international. The purpose of this chapter is to map the extraregional aeromobility space of Los Angeles primarily as it is articulated through LAX, including its extent, intensity of use, how it has changed over time, and how it has interrelated with regional political, economic, and social relations.

The fourth chapter begins a two-chapter analysis focused on the reuse of Marine Corps Air Station El Toro, whose closure announcement precipitated a lengthy conflict which enlisted various levels of support and resistance from actors across multiple scales, including the communities neighboring El Toro (e.g., Orange County and the City of Irvine), regional actors and associations of local interests (e.g., the Southern California Association of Governments), the state of California, and the federal government (particularly the FAA and the Department of Defense). This chapter offers a relatively straightforward mapping of airports within the Los Angeles region, as well as providing a background on the regionalization strategies which have driven so much of the development and planning process for the Los Angeles city-regional airport system. I also introduce the regional stakeholders who mobilize to support or oppose aviation reuse for El Toro in the wake of its decommissioning announcement.

While the fourth chapter provides a background for the El Toro reuse struggle, the fifth chapter turns towards developing a better understanding of the political conflict as it unfolded, including the relationship between aerial-space and the mechanisms of its production. It focuses this discussion around the processes by which the proposed usage of the El Toro site emerged through the interplay 1) of competing sets of regional political-economic interests and, 2) of passenger aircraft performing aerial space in dynamic interaction with a physical-ecological
surround, including terrain features, other airborne equipment, and the physical forces governing flight.

The sixth and final chapter concludes the dissertation with a summary of its findings, a discussion of some contributions it offers for related fields of inquiry, and some suggestions for future research and theorization by which my findings and conceptualizations may be extended or improved.
Chapter 2

REVIEW OF AERIAL-RELATED LITERATURE

I situate the dissertation at the confluence of four streams of literature. The first of these encompasses debates over how we understand the city-region as an object of study: as territorially-bounded jurisdictional units, as a boundless relational construct, or as hybrid arrangements of the two. The second stream of literature centers on global cities research, particularly the approaches it offers for the measurement and analysis of cities as nodes within networks of interurban exchange. The third stream comprises mobilities research, to which I owe numerous conceptual debts related to its unpacking of the dialectical interaction between aerial mobilities and immobilities. I also draw from a disparate body of literature and media centered on Los Angeles. The authors and artists of these works often interpret Los Angeles as archetypal of the postmodern city. In the following chapter, I summarize the extent of research within each of these streams as it relates to the aerial region of Los Angeles.

Conceptualizing the City-Region

We often conceive of cities as fixed, finished, finite objects. In the following discussion I introduce an ongoing conversation on the city as territorial or relational object of study, and summarize some proposed alternative understandings.

Cartographers and other political actors delimit urban political boundaries on terrestrially-oriented base maps, exerting power over urban terrestriality on, through, and within the mapping process and its products (Harley, 1989). The maps with which we most often relate in our everyday lives — including road maps, weather maps, voting district maps, transit maps, cellphone coverage maps, and airline route maps — typically present thematic information with
reference to terrestrial features such as locally-recognizable landmarks, road networks, transit stations or airports, and national or subnational boundaries. Cartographic depictions of the terrestrial surface typically denote cities as points, in the case of small-scale (national or world) maps, or as politically-constructed, polygonally-enclosed units, in the case of larger-scale (local) representations. This is the urban understanding most associated with Louis Wirth (1938), who observed,

the city and the country may be regarded as two poles in reference to one or the other of which all human settlements tend to arrange themselves […] In viewing urban-industrial and rural-folk society as two ideal types of communities, we obtain a perspective for the analysis of basic models of human association that appear in contemporary civilization. (quoted in Brenner, 2011; 0:17:36)

For urbanists such as Wirth, “all human settlements” fall into one or another type of community. For Wirth there are two categories: the urban and the non-urban, or rural. More recent urbanists have added other distinct settlement types to this basic formulation, including suburbs, exurbs, megalopolis, and global cities. Naturalizing settlement types in this way demands we treat process as form; we stop time in a particular place, impose a frame upon it, and analyze what we see (e.g., a town, an edge city, a suburb) instead of analyzing the process of urbanization, which transcends the frames we impose upon particular places. As with the Kármán Line's demarcation of outer-space, our analysis of place must take account of changes in the quality of their production. We must frame cities as events, not as jurisdictionally-bounded constructs, to better understand how urbanization — Castells’ “social production of spatial forms” — configures and reconfigures “activities and populations” within a limited spatial form, whose development correlates (asymmetrically) with that of other social formations within its interurban networks (e.g., via air travel, telecommunications, financial transactions, and other forms of exchange).

In a paper from 1909, cartographer Mark Jefferson compared “some great cities” according to population density. Methods for defining cities in 1909 — as they often still do — centered around a Wirthian (or proto-Wirthian) model: urbanists understood the object of their
study to be those relatively densely-populated, politically-constructed units of jurisdictionally-bounded terrestrial surface area. Demographers and urbanists drew conclusions about, and influenced policy for, these bounded terrestrial-units based in large part on the qualities and quantities of the population each contained. Jefferson rejected this deductive approach for its failure to account for cities as they are actually experienced. His *anthropographic* understanding of cities is among the first to veer from notions that settlement-types are somehow a natural given. Jefferson's work — though not explicitly laid out as such — flows instead from assumptions that spatial forms are socially produced.

For Jefferson, urban dwellers perform place without regard for discretely-bounded political-constructions. He understood urbanization as spatiotemporally continuous. There is no natural break between New York City and its adjacent urbanized region, Jefferson argued, advocating a more experientially-informed conceptualization of the New York city-region, in which “Jersey City and Hoboken must be included and probably also Newark” (543). Using his inductive approach, Jefferson suggested an understanding of cities that called attention to intensifications or clusterings of urban-ness. He mapped and analyzed population densities of major urban agglomerations without regard for jurisdictional boundaries. These anthropographic-city maps opposed traditional conceptions of a bordered, 'political city,' asserting new forms and therefore new social configurations (Jefferson 1909; Crampton 2004, 2010; Crampton and Krygier 2006). Jefferson's conceptual mappings anticipated a shift within urbanist literature which achieved a more thorough expression over the period following World War II, in which urbanization itself had reached “the end of a process during which the old urban forms, the end result of a series of discontinuous transformations, burst apart” (Lefebvre, 1970/2003, 2). Passenger air travel represents one mode by which this 'bursting apart' has taken place,

19 A portmanteau combining the Greek *anthropos*, meaning “human beings,” with *graphikos*, meaning “pertaining to, or belonging to, drawing.”
dissolving the discontinuities between urban agglomerations on the terrestrial surface through the
development of the atmosphere as a site of production for a range urban social forms, including
passenger air travel, air freight transport, airborne warfare, aerial surveillance, and a host of other
aerosolized urban activities.

Within urban policy research and planning practices, however, the deductive approach and the jurisdictionally-bounded (terrestrial) city model continue to dominate, particularly for
 describing the spaces of origin or effect for particular policies or urban sociospatial phenomena. Such approaches privilege static, atemporal conceptions of urban space as form, not process. In
 adopting these as our categories of spatial- or policy- analysis, we fail to take account of interurban relationships which may also lead us to ignore or inadequately address policy consequences which transcend territory, place, or scale (Warren and Weschler, 1976).

The political, economic, and social life of cities is therefore limited neither to merely internal activities nor to those merely terrestrial. Within urban regions, the production and delivery of urban services requires input from an array of actors at multiple scales of governance, including international governing bodies, non-state participants, transnational arrangements, and momentarily-assembled 'mobile publics' (Warren, Rosentraub, and Weschler, 1988; Sheller, 2002; cf. discussion in Rosentraub and al-Habil, 2009). Jefferson (1909), along with Warren and Weschler (1976) and Brenner (2011) suggest that if we are to effectively analyze urbanization as a multivalent process we require conceptual vocabularies that offer descriptive alternatives which more usefully describe urban-spatial differentiation as it is actually performed by our dwelling-in-motion. As flexible containers expand to accommodate the shape of their contents, these new conceptual vocabularies must dynamically conform to urban space as it is actually performed, experienced, and occupied by urban dwellers whose social practices increasingly transcend the relatively static frames of place, territory, and scale (Brenner, 2011).

Recognizing the co-constitutionality of local places and global spaces is an initial step towards creating new conceptual vocabularies for describing urban space, and for crafting modes
of globalization based on transregional governance or other, as-yet unimagined collaborative arrangements (Massey 2004; Hubbard 2001). Massey, in particular, calls for an understanding of urban space that incorporates translocal spatial relations which extend our conceptions of local public spheres so that they account not only for the interests of territorially-defined, situated publics but also for those of relationally-constituted, distanciated publics. Sheller (2004) adds to these interests those of mobile publics: ephemeral social assemblages based on shared mobility, whose capacity for spatial production correlates with the frequency and intensity of interurban exchange.

Technological innovations enabling interurban exchange — i.e., telecommunications and transportation technologies — continue to accelerate and expand the spatial dispersion of world economic production centers, enfolding new city-regions within a process of global capitalist restructuring (Brenner 1998). In its most abstract sense this process of globalization occurs as rifting, or reconfiguring, relationships between scales of human activity, the “nested hierarchical structures of organization” (Harvey 1982, 423). Because they are generally free of the burdens of a welfare state, city-regions have proven better equipped than the nation-state for economic competition within this moment of scalar-relational transformation. Capitalizing on this competitive advantage, neoliberal states have pursued strategies for rescaling political power to their most intensely-agglomerated city-regions. Certain of these have successfully articulated the economic and political interests of their nation-states at the global scale; certain others exert strategic control over the processes of global capitalist restructuring itself (Massey 2004; Sassen, 1991; Scott et al., 2001). These so-called 'global cities' have become centers for the innovation and performance of techniques for capital accumulation and 'time-space compression' (Harvey, 1989; 240). Their chief strategic concerns center on sustaining and enlisting the participation of subordinate urban-regional production centers within the ongoing process of global capitalist restructuring.
Emergent modes of mobility, telecommunications, and citizen empowerment enable new modes of political organization even as they destabilize the state-centered one (Brenner 2004, Hajer 2003, 175). This process of rescaling, or reterritorialization, far from building a nonscaled, nonterritorialized politics, has instead led to a city-regional politics that continues to take place within, and derive legitimacy from, territorially-defined “local public spheres” (Amin 2004, 37). If we deduce these local public spheres from a given city-region as it “existed naturally prior to the act of mapping” (Crampton and Krygier 2006, 23), we legitimate political participation by one set of people and delegitimate that by another set, though members of both sets may be affected by activities originating within the region in question. Demarcating a territory, in other words, is a political act denying the relational construction of the territory demarcated, particularly by excluding from the public sphere those distanced or mobile actors whose activities correlate with those of the situated public (Massey, 1993). This literature is vital to the dissertation because, at bottom, I examine how the local situation of the Los Angeles city-region extends beyond the territorial, embedding within global networks of social relations and mobility-enabling infrastructural connections, including commercial passenger networks (Ali and Keil 2007; Brenner 2004):

Instead then, of thinking of places as areas with boundaries around, they can be imagined as articulated moments in networks of social relations and understandings. And this in turn allows a sense of place which is extra-verted, which includes a consciousness of its links with the wider world, which integrates in a positive way the global and the local. (Massey, 1993; 66)

Global cities research provides a model of inquiry into relationally-constituted, networked city-regions, especially through operationalizing network linkages and illustrating what these linkages mean for the process of urbanization.

**Measuring Interurban Relationships**

Since the mid-1980s, approaches within global cities research have expanded beyond mere examinations of which city-regions contain certain relational facilities — primarily banks
and corporate headquarters — to include a variety of more sophisticated methods for measuring actual relations between cities in the global city network (cf. Beaverstock, 2000; 125, for a criticism of the former, attribute-based approach). One aspect of this latter, relational approach has particular bearing on this dissertation. Global cities research has made significant contributions to the measurement and analysis of inferred or actual exchange relationships among urban regions, including those exchanges taking place within the atmosphere. Many researchers within the global cities research tradition have analyzed international aviation networks, for example, because air travel has become the primary mode for the long-distance transfer of people (and therefore of knowledge) within the global economy (e.g., Keeling, 1995; Cattan, 1995; Kunzmann, 1998; Rimmer, 1998; Smith and Timberlake, 2001, 2002; Bowen, 2002; O’Connor, 2003; Cattan, 2004; Matsumoto, 2004; Derudder & Witlox, 2005; Zook and Brunn, 2005; Matsumoto, 2007; Taylor et al., 2007; Derudder et al., 2008; Grubesic et al., 2008). Though my research in this dissertation does not constitute a traditional global cities analysis, my review of the literature intends to distill some lessons these analyses can offer for addressing the biases of passenger traffic data for major urban regions, including Los Angeles.

The development of global city theory began in the early-1980s, first by Cohen (1981), and later by Timberlake (1985) and Friedmann (1986). Friedman's conceptualization of a world city hierarchy gave new expression to the “spatial organization of the new international division of labor” (69) as a tiered, hierarchical interurban configuration, based largely on economic and political relations. In subsequent works using Friedmann's early conceptualizations, global cities researchers have generally begun from one of two primary assumptions about the role of cities within the global economy.

First is the assumption that command and control functions for the global economy concentrate most heavily in a small set of powerful 'global cities' (Sassen, 1991; 2001). This assumption has inspired debate regarding which cities belong in this set and how these central actors relate both to each other, as well as to the rest of the system. Global cities researchers have
traditionally acknowledged the global city experience for only a subset of all urbanized agglomerations, most of which are located within the global North (Robinson, 2002). More recent literature, however, has emphasized a range of 'globalization' experiences (Taylor et al., 2007) within cities across the globe, many privileging cultural or social exchange relationships over purely economic or political linkages (Robinson, 2005).

The second assumption about global city relations is that it takes place within networks of interurban exchange. City-regions relate within the knowledge economy primarily through networks of telecommunications and transportation infrastructures (Taylor, 2004). This assumption has led to conversations within the global cities research community on the constitution of interurban exchange and how we might best measure, or otherwise examine, these relationships (cf., Neal, 2010). Global city theory, for instance, has informed numerous theoretical and quantitative-based descriptions of the relationship between local and global economic development, particularly of how global city network formations give rise to intensifying linkages among transnational corporations and organizations, governance institutions, family units, and cities themselves (Waters, 2001).

Where urban status and regional or global economic significance once accrued to cities by virtue of their ability to extract value from, and consolidate command and control within, a space of places (i.e., their local hinterland; cf. von Thünen, 1826/1966; Christaller, 1933/1966; cited in Neal, 2010), Castells (1996) and others have reconceptualized contemporary urban relations as constitutive of a space of flows. According to this space of flows framework, urban status and economic significance accrue to cities by virtue of their participation in interurban exchange relationships. The global city paradigm, Castells argues, is “the most direct illustration” of this new, network-based spatial logic (415). In the space of flows, cities gain status either through consolidating command and control functions within global networks of exchange (Sassen, 2002), improving the efficiency of networked exchanges that pass through them (Harvey, 1989), or both. Global cities researchers seeking to understand how cities relate
within a space of flows typically examine the degrees to which cities participate in networks that involve the interurban exchange of people, information, or capital and authority (cf. Neal, 2010; 2196-2198). Measuring how cities participate within exchange networks for each of these provides us with a better understanding not only of how cities in general function and relate within the frame of global economic restructuring but also of how cities in particular articulate this turbulence within the local frames of place, scale, and territory. In the global economy, cities’ functions derive from their linkages to other places, which not only allow cities to draw resources from and serve the needs of distant lands, but also establish distinctly structural urban roles like hubs where flows converge (for example, New York), bridges where disconnected parts of the network are linked (for example, Miami) and even isolates with few extraregional relationships (for example, Detroit). (Neal, 2010; 2196)

The participation of cities within networks of interurban exchange therefore affords them opportunities for expressing their particular set of economic, political, and social relations within both a local hinterland — a space of places — as well as a global hinterworld — a space of flows (Taylor, 2001; Taylor and Walker, 2004). Participation in the interurban exchange of information thus projects and reinforces city-regions' creative and innovative functions in relation to others in the network. Likewise, participation in the interurban exchange of people projects and reinforces city-regions' functional capacities for production and consumption.

Global cities researchers have inferred or measured these interurban exchange relationships using three primary approaches. Early work in this arena often examined the mere presence of exchange-related institutions within urbanized places. Using information on (mostly) economic attributes — financial firm headquarters locations, for example — researchers have inferred structural relationships among cities based on presumed institutional exchange. Because this data is often easier to collect than those from proprietary sources, attributional data is often used to compile global city hierarchies, in which rankings for each city derive from a set of attributional factors, including transnational corporate headquarters, government complexes or
facilities, and periodic urban spectacles (e.g., the Olympics and the 1995 Rolling Stones world tour (Short et al., 1996; cited in Neal, 2010).

A second approach for describing the position of individual urban regions within the global city network is to examine the potential for interurban exchange by measuring the infrastructural capacity for transfers of people, information, or authority. Researchers adopting this approach have looked at a wide range of institutional and physical infrastructure, including banking activity (Conzen, 1977), headquarter-subsidiary linkages (Ross, 1987; Alderson and Beckfield, 2004), internet bandwidth or infrastructure capacities (Malecki, 2002; O'Kelly and Grubesic, 2002; Malecki and Wei, 2009), and — most importantly for the dissertation — the scheduled capacity of passenger flights (Ivy et al., 1995; Bowen, 2002; Zook and Brunn, 2006). Unlike methods relying on attributional data, this approach measures actual exchange relationships rather than inferring from the presence of institutions and facilities which commonly mediate exchange. On the other hand, measures of these infrastructural “networks capture only where passengers or information could travel, but not where they do travel; they measure accessibility, but not access” (Neal, 2010; 2198). Researchers adopting this approach must therefore infer actual exchange relationships.

The third approach for measuring interurban-exchange examines actual flows, or exchanges, performed through interurban relationships. Studies relying on this approach typically examine volumes of passenger or cargo traffic, as well as the amounts of bandwidth consumed. Of the three approaches, measuring actual flows most directly demonstrates centrality within networks of interurban exchange, largely by capturing “actual exchanges rather than simply the opportunity for exchange” (Neal, 2010; 2198). Unfortunately, the data on exchange volumes are often publicly inaccessible, either as the property of a privately-owned corporation, available for purchase from a data-collection organization, or available only through formal negotiation with a bureaucracy, as in a Freedom of Information Act request (FOIA). Moreover, because global cities researchers most often study network relationships at the global scale, they...
encounter differences in data-collection standards among the diverse set of national or international institutions, none of which offer a truly global data source for air passenger exchange (Derudder et al., 2007).

Networked infrastructures enabling interurban exchanges develop in dialectical relation with the global-city system itself (Keeling, 1995). As integral components of interurban exchange within “the knowledge-based economy” (OECD, 1996), both the Internet (Malecki, 2002) and the air transport network (Graham, 1998) have become entry-points for inquiry into how this dialectical relationship unfolds (cf. Tranos, 2011). In the case of air transport, both the global aviation network and the global city network mutually emerge through continuous interaction with one another, articulating a set of material spatial practices — namely, the mobility of a managerial elite, whose members exert decision-making and organizational dominance within the global knowledge-based economy (Lefebvre, 1974; Castells, 1996). As described by Castells (1996), the logic of the space of flows sustains a form of social dominance based on “articulation of the elites [and] segmentation and disorganization of the masses” (445-446). One consequence of this for passenger air service — and for urban services in general — has been increasingly deregulated, increasingly flexible service-delivery configurations, enabling providers to “unbundle” their services and cherry-pick urban regional customer bases (Graham and Marvin, 1996, 2001). Most existing measures of interurban exchange enabled by aviation infrastructure express both the flexibility of the network and the uneven effects it has on urban regions around the world:

because of its relatively rapid capacity to reply in terms of supply and demand, air traffic provides a pertinent indicator in the quest to evaluate the international character of ... cities. (Cattan, 1995, p. 303)

The configuration of the global aviation network, and its reconfiguration in response to changes in supply and demand over time, can thus help us better understand what ‘price must be paid’ by cities to ascend (or descend) the global city hierarchy (Kowarick, 1986; cited in Davis, 2005).
Measuring capacities or volumes of air passenger exchange, especially at the global scale, has only recently received critical treatment from a group of researchers in the Global and World Cities research network. Derudder & Witlox (2005) summarize Smith and Timberlake (2001, 2002) and Keeling (1995), who advocate the use of such data for mapping global city network configurations and particular cities' positions within it.

**Placing Airports within Urban Studies**

I have noted two streams of literature whose authors examine the sites and practices of aerial-spatial production — more specifically, with airports and aerial linkages. Authors working within the conceptual frameworks of global cities literature and related fields most often examine these aerial-related urban phenomena as a means for considering if and, more particularly, *how* urban centers interrelate (either potentially or actually) via networks of exchange. Authors who study transportation technologies and cultures — transportation geographers, mobilities researchers, tourist researchers, assorted sociologists and urbanists — often analyze such aerial phenomena not as networked nodes and connections but rather as spatial practices producing uneven social, political, economic, environmental, and other consequences. The third stream of literature within which I situate this dissertation directly addresses the sites and practices of aerial-spatial production: airports, airport systems, routes, and networks. The interdisciplinary set of scholars invested, directly or otherwise, within the field of airport studies all bring their particular conceptual vocabularies to bear on illustrating the place and function of airport facilities (and their flight-enabled extensions) within contemporary modes of urbanization.

The dialectically unfolding relationship between the forms and practices enabling air travel and related modes of dwelling-in-the-air produce and occupy an aerial-spatiality: what I term in this dissertation an *aeriality*. Though the terrestrially-grounded places of city-regions (indeed, *all* terrestrially-grounded *anything*) interact with their atmospheric envelope, the ability to occupy that envelope *as a volume* — to produce aeriality — has become crucial for city-
regional participation within the current round of global economic restructuring (Urry, 2000; Cidell, 2006; Hummels, 2007). This production of aeriality at the global scale has come at an economic cost for other areas and city-regions:

Jumbos have enabled Korean computer consultants to fly to Silicon Valley as if popping next door, and Singapore entrepreneurs to reach Seattle in a day. The borders of the world’s greatest ocean have been joined as never before. And Boeing has brought these people together. But what about those they fly over, on their islands five miles below? … Air travel might enable businessmen to buzz across the ocean but the concurrent decline in shipping has only increased the isolation of many island communities. (cited in Massey, 1994; 148; quoted in Urry, 2000; 64)

In this sense, air travel networks have (intentionally or otherwise) excluded certain groups from full participation and access to the most comprehensive and far-reaching forms of transnational mobility. The operations, regulation, and governance of air travel networks therefore articulates a certain politics of mobility, which enhances the positions of some places and peoples relative to others (Massey, 1993; Sheppard, 2002). Aaltola (2005), considers the role of airports in the construction and maintenance of the contemporary American empire. His observation that “imperial borders differ from the customary boundaries of sovereign states” means that, through a politics of mobility, “the main arteries of the globalized world have turned into boundaries of the American led empire.” The governance and regulation of air travel has imbued airports with a set of political functions beyond those associated with its role in facilitating our transition between aerial and terrestrial modes of mobility:

An airport provides a particularly well-suited place in which to learn the hierarchical world-order imagination. The experienced eye, which has been trained through frequent airport experiences, quickly scans around for the airport types. This eye belongs not only to the border or security guard. It belongs potentially to any person placed in the intensity of intersecting people at an airport. Placed in the airport, a person recognizes the types and remembers their own
respective position among them. To walk through the airport frame is simultaneously to learn and remember the global context of the international airport. (275)

In the following section, I briefly identify some important contributions to the study of airports as nodes (e.g., nodes of development, nodes of mobility) within city-regions as well as of the networked patterns of the inter-airport pathways which comprise transregional connectivity.

Airports as Urban Nodes

Within recent planning literature, some authors have called for a (re)new(ed) emphasis on more fully integrating the airport within local, regional, and national planning processes. Freestone and Baker (2011), for example, review a broad range of material related to “the spatial implications of extensive airport-led development” (269). The authors identify “the need for greater convergence between airport and city planning” (274), advocating for improved recognition by (terrestrial) urban planners and airport stakeholders of “interface” issues related to aeromobility (i.e., economic, environmental, and social issues) and the creation of new airport governance frameworks designed to address these. Along with Freestone and Baker, Stevens (2010) call for a new interpretive framework for airport-centered development (particularly in the Australian context), “which recognises and attempts to understand the nature and importance of international, national, regional and local drivers of airport and regional growth and the need for sustainable balanced development given new corporate, public, and institutional governance processes” (280). Taking May's (2003) four sustainability criteria — economic efficiency, environment, coordination, and community — as a starting point, the authors add an additional criterion: security — a dimension of airports and air travel that shifts the focus of sustainability planning from the local realm of the airport and its immediate surround “regionally to the important nodes and networks of critical infrastructure servicing and linked to the airport, which are also potential targets for crime and terrorism.”
Planning literature in this vein frequently calls attention to the shortcomings of traditional frameworks for understanding and addressing the airport's relationship with the broader political, economic, social, and environmental objectives of its surrounding region. Kasarda's work on the aerotropolis model (2010) represents perhaps the most celebrated conceptualization, not just of airport-led urban development but of urban development in the general sense. According to his aerotropolis framework, the globalizing economy's reliance on just-in-time production mechanisms and flexible distribution chains elevates the strategic importance of airports to city-regions around the world. Much as transportation technologies have revolutionized sociospatial relations throughout history — e.g., twentieth-century's automobiles, the nineteenth's railroads, and the eighteenth's seaports — Kasarda claims aeromobility or, more specifically, those facilities providing it, will radically reconfigure urban landscapes of the twenty-first century. Along with Irwin (1991), for example, Kasarda notes that certain measures of economic growth (chiefly, employment) within a city-region depend in part upon the position of its airport(s) within airline network hierarchies. City-regions have a choice: develop according to the aerotropolis model or risk falling behind in the global economic competition just as it intensifies.20 One problem in this arrangement is its failure to account for how developing according to the aerotropolis model consolidates decision-making power in the hands of privately-owned airlines and privately-owned (or quasi-public) airport facilities. In a technical

20 Ishutkina and Hansman (2008) examine the coevolution of a domestic air transport systems and national economies (specifically, GDP), finding a strong correlation between the growth of each system. As the air transport system achieves saturation, however, “the cost of delays has an adverse affect on economic activity” (17). The global air transport system, too, has developed in dialectic interaction with the restructuring global economy, most intensely since the era following deregulation, but also since the end of the Second World War. The rise of the transnational corporation — the prime mover of global capitalist restructuring — coincides with the widespread use of jet aircraft beginning in the late-1950s, which “made possible the coordination and control of geographically dispersed operations” (Dicken, 2011; 85) as well as the development of just-in-time production strategies reliant upon perishable goods (e.g., certain foods, some electronic components; World Bank, 2009; 177; quoted in Dicken, 2011; 85).
paper for the World Bank, Kapur (2003) calls for “a strategic framework” by which national and international regulators can manage the “profound structural and ownership changes within the aviation industry” in a way that allows for airport privatization, though not at the expense of addressing the other demands of the aviation sector (e.g., growth in passenger volumes, economic growth in zones adjacent to airports, its harmful environmental products).

These proposals for new ways of integrating airports and their functions into planning processes seem to have been outpaced by radical transformations to the airport landscape itself. Urban functions once performed nearby airports have taken root within them. That is old news: airports have long housed many activities and services once found only in the surrounding urban region, including specialized retail, places of worship, office space, hotels, art galleries, high-end restaurants, gyms, nurseries, hospitals, brothels, casinos, arcades, parks, mortuaries, and independent police or fire departments (a similar list can be found in Urry 2009, 28). McNeil (2009) notes that at least one commonly internalized facility, the airport hotel, is undergoing massive transformations with regard to its functional and spatial relations with the airport and surrounding urban space:

The release of platform territory (as opposed to land abutting the airport) for integrated hotel development is now an important strategy, as seen, for example, in Hong Kong International Airport’s 1000 room Marriott hotel at their SkyCity development. This hotel is a key element in Hong Kong’s Global TransPark model, where the airport acts as an important logistical centre for air cargo, telecommunications, flexible manufacturing, and logistics, particularly where the goods involved are high-value, but low weight (Kasarda 1998; Sit 2004).

De Neufville (1995) examines how the physical layout of an airport facility itself can alter its position within the aeromobility network. The difficulty for passengers making connecting flights between Kansas City International Airport's three linear terminals, for instance, forced TWA to relocate its transfer-hub operations to St. Louis (which has subsequently become the poster airport for hubs on the decline, even before a 2011 tornado
forced its temporary closure: see Levere, 2012; Sulzeberge, 2011). The rise in airlines' use of such transfer hubs such as TWA's St. Louis corresponds with a rise in midfield terminal airport design, the most notable example of which is Atlanta's Hartsfield-Jackson International (ATL), the busiest passenger airport in the world. Airport engineers and architects have designed midfield terminal airports with one or more landside facilities for processing passengers, who are then conveyed via train or moving-walkway to decoupled, airside terminal facilities, around whose entire exterior(s) aircraft may cluster and move. ATL, for example, has two passenger processing facilities (North and South Terminals) connected to five midfield concourses (A through E) by an automated people mover. This design minimizes not only the distance transferring passengers must travel between aircraft but also the distance and wait-time of aircraft traveling between runway and terminal-gate (de Neufville, 1995; 101). Lyster (2010) reimagines the Chicago's O'Hare International Airport (ORD) as a peripheral embarkation/debarcation facility decoupled from a high-rise 'Vertical Terminal' passenger-processing facility in downtown Chicago:

Decoupling the airfield and terminal into separate locations remote from each other allows the terminal to occupy a downtown location and directly interface with the city it serves. Moving check-in facilities away from the airfield is conceivable given the increase of high-speed connections between airports and downtown areas (the high-speed Maglev train from Pudong International Airport to downtown Shanghai travels at 268 mph and takes 8 min). Moreover, augmenting terminal facilities to serve non-travelers that live and work in the city is an attractive model for airlines in difficult economic times. (103-106)

Lyster also reimagines a more tightly integrated regional airport system for Chicago, in which O'Hare subverts contemporary airport expansion trends (e.g., bigger footprints, more gates and terminals) through distributing regional commuter flights to smaller 'air-stations' near areas where high-densities of commuters reside, allowing O'Hare to expand its longer-distance, large-aircraft movements in the spaces vacated by more frequent, smaller-aircraft commuter
operations. The NASA-affiliated CAFE Foundation (Comparative Aircraft Flight Efficiency) has published several research articles speculating on how a distributed system of 'pocket airports' might connect outlying communities with a central, regional airport using autonomously-piloted, 2–4 seat personal air vehicles (PAVs) (see also Coxworth, 2010).

Though these speculative visions of air travel futures may seem implausible given our current sociopolitical environment, we have already witnessed not nearly so radical forms of deconcentrated aeromobility service provision. Successive rounds of global air travel deregulation (begun in the United States in 1978 and in Europe throughout the 1990s) have fundamentally altered the balance of power between airports and airlines, primarily by opening up the market to a range of new business models:

With liberalization and open skies agreements, airports can bid for airline services, and airlines are free to choose which airport best serves their needs and their business model. (Gillen, 2011; 13)

In Europe, existing forms of regulation and planning laws have become the only policy tools that remain for national governments to influence economic and environmental outcomes in an air transport landscape dominated by privately-owned airlines and airports (Humphreys and Francis, 2002).

Deregulation has given rise to low-cost carriers (LCCs) in both the United States and Europe throughout the past two decades. Though they differ with respect to the details, LCCs more or less engage in a business model that 1) saves on landing fees by using peripheral, second-tier airport facilities, 2) saves on maintenance and training costs by using a narrow range of aircraft, 3) saves service costs by minimizing service 'frills', and 4) often uses a point-to-point network instead of a hub-and-spoke network, as some of the full-service carriers do. This latter point, on the network structure of LCCs, has received attention both for carriers in the United States (Reynolds-Feighan, 2001) and Europe (Dobruszkes, 2006). The operations of low-cost carriers have transformed airports (Gillen and Lall, 2004; Francis et al. 2003; Barrett, 2004) and
regions alike, producing a range of economic externalities, including improved absolute levels of access to air travel, altered travel habits, heightened inequalities of access for certain regions, and increased uncertainty through LCCs' low sunk costs in airport facilities relative to established air carriers (Williams and Balaz, 2009). Pantazis and Liefner (2006), for example, found that Hanover Airport's acceptance of LCC operators helped to expand its catchment area, enabling it to compete more effectively with its nearest rival, Hamburg Airport, primarily by attracting customers through low-cost tickets and direct flights that eliminated transfers at busy hubs.

**Air Routes as Urban Networks**

The methods and intent of much of the work organized under global cities research overlaps in interesting ways with those of the more informal field of airport studies. Without regard to the bounds of one field or another, I offer this section as a summary of general research within this overlap. All are united by their attempts to improve our understanding of how city-regions become partially constituted through global air traffic linkages. Most of these studies begin from what has lately become a commonplace assumption: that airport facilities articulate and order global mobility (Parker, 2005). In this sense, critical research into airport networks and the global web of air travel routes is concerned with presenting to us how airports and their correlative network structures instruct us in “the central rituals” required to navigate and maintain the global order, “the main arteries [of which] have turned into boundaries of the American led empire” (Aaltola, 2005; 261-262).

Analyzing this articulative process is no easy task. This is mostly because clear and timely analyses often rely upon data that are either expensive or difficult to access and compile. Looking at the structure and intensity of air traffic movements involving a single airport may help us locate its position within the global aeromobility network (O'Connor and Fuellhart, 2012) but relational data — which detail how airports relate with others via aerial linkages — enable a range of methods for illustrating the shifting positions of city-regions within network hierarchies.
Derudder et al. (2007), for example, use airline data to illustrate the positions of city-regions in
the United States relative to other global cities in the world cities network (commonly
abbreviated in the literature as WCN). The dozen or so authors who have used air passenger
traffic data to similar ends\textsuperscript{21} have usually begun from a core assumption:

As Taylor (2004, p. 42), following Castells (1996), puts it: cities “operate in a
contemporary space of flows that enables them to have a global reach when
circumstances require such connections.” From an empirical point of view, the
consequences of this clear-cut relational standpoint are self-evident. Since all
measurement and data should be the products of theory, empirical analyses of the
WCN should reflect the relational perspective that lies at the root of its
conceptualization. If we wish to take forward the view of world cities as a process
(re)produced by global networking and connectivity, it is vital that relational data
are sought after. (Derudder et al., 2007; 76–77)

This is as true of studies emphasizing the structure and configuration of nodal hierarchies within
the space of global airline networks (Keeling, 1995; Rimmer, 1996; Matsumoto, 2004; Grubesic,
2008) as it is for those examining the change in these networks over time (O'Connor, 2003).\textsuperscript{22}

One productive mode of inquiry in this vein is to examine air passenger networks around
the world as coherent expressions of regional, national, or global mobility. An active group of
Australian researchers, for example, have recently considered how the functions of Australian
city-regions relate with their domestic and international air service provision — finding, in one
instance, that Melbourne's growth as a destination for international tourists and students is
reflected in its expanded share of international air traffic linkages, especially to Asian and the
Middle East (Fuellhart and O'Connor, 2012). In an earlier study, O'Connor (1998) found that the
international linkages of some Australian city-regions express the dialectical relationship

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\textsuperscript{21} A partial list includes Cattan, 1995; Keeling, 1995; Kunzmann, 1998; Rimmer, 1998; Smith
and Timberlake, 2001, 2002; O’Connor, 2003; Matsumoto, 2004; Derudder and Witlox, 2005a;
Zook and Brunn, 2006.

\textsuperscript{22} Dozens of authors have examined
between demand for aeromobility — a reflection of interurban “business, tourism and social ties” — and its supply — including “the geographical position of places and the availability of international airports” (153). A similar study (Burns et al., 2008) used air passenger flows to gain a better understanding of Europe, particularly the changing spatial configuration of its city-regional relationships. Hooper et al. (2011) trace the development of air passenger traffic connections for Middle Eastern city-regions, documenting their emergence from stopover points in linear, cross-global air routes to become in many cases high-volume nodes in dense regional networks (Hooper et al., 2011). Otiso et al. (2011) illustrate the differentiated growth in air passenger traffic in African cities since the 1980s. Papatheodorou and Arvanitis (2009) describe the development of air passenger networks in Greece during the period between 1978 and 2000. Tan (2007) compares Singapore with Calcutta. Singapore has successfully transformed from port city to airport city, allowing the city-state to greatly expand its hinterland; Calcutta's once-extensive hinterland, on the other hand, has dwindled with the declining capacity of its port and airport.

Other research has examined the shift in aeromobility network across time, focusing particular attention on changes precipitated by shifts in policy, markets, geology, or climate. There have been numerous studies on deregulation and its effects on aviation in the United States, especially with regard to markets (for example, Meyer and Menzies, 2000) and networks (Brueckner and Spiller, 1994; Goetz and Sutton, 1997; Gillen and Morrison, 2005). Though less attention has been paid to deregulation and its effects in the European Union (Burghouwt and Hakfoort, 2001 Burghouwt et al., 2003; Burghouwt and de Wit, 2003), some authors have considered its negative consequences on smaller airports unable to compete with major hubs (Reynolds-Feighan, 1995); as well as the benefits of deregulation that accrue to large airports able to exploit and build upon their central position in air traffic networks (Caves, 1997; Dennis, 1998). Goetz and Vowles (2000) and Goetz (2000) consider how airline deregulation in the United States has given rise to “pockets of pain”: those regions which — either through
geography, demography, airport attributes, or some combination of the three — have been excluded from the hub-and-spoke networked air traffic of the domestic major airlines.

Zook and Brunn (2006) have more recently taken up “pockets of pain” concept in their discussion of the structure of the global airline network for cities in ten global regions. They produce maps of position-grams for each of these regions, comparing cities according to their distances, costs, and times, from major hub cities. The relative size of each of these elliptical position-gram corresponds to the similarity or dissimilarity among these variables for the cities contained therein: smaller ellipses suggest a high degree of similarity amongst a region's cities with respect to distance, time, and costs to hubs; larger ellipses suggest a high degree of variation. With regard to “pockets of pain,” the authors,

think this concept is worth exploring in a global context and with a large set of cities. Since deregulation is occurring on all continents, identifying those “pain” pockets or regions would seem worthy of analysis. While some of the unexplained variance in cost distance in our models no doubt can be attributed to the structure of the international airline industry (e.g., national regulatory structures) and greater geopolitical issues, the exploration of additional city-level measures of connection to the global system seems a fruitful avenue for improving these models.

In his study of global air traffic patterns from 1990 to 2000, O’Connor (2003) finds a similar shape to the global network; during that period, deregulation created a slightly deconcentrated air traffic landscape: megahubs retained megahub status, while ceding much of their traffic to second-tier airports in the same city or lower-ranked airports elsewhere. In a study of air traffic for the United States within an overlapping period (from 1990 to 2002), Reynolds-Feighan (2007) finds that air traffic concentrated between 1990 and 1997, deconcentrated slightly from 1997 to 1998, before stabilizing until 2002. In a related analysis of Spanish air traffic distribution from 2001 to 2008, Suau-Sanchez and Burghouwt (2010) found spatial deconcentration among airports for both intra-European and intercontinental passenger traffic, while Madrid — far and away Spain's busiest airport — retained its role as the nation's dominant megahub. At the level of
international aeromobility, Button (2009) has examined the long-term economic effects of transatlantic open skies agreements between the United States and Europe, finding that the bilateral arrangement did little to alleviate airport congestion on either side of the Atlantic.

Pearey and Alexander (1951) offer an early mapping of the 'pattern of air service availability' for the Western Hemisphere in the era preceding the 'jet age.' They note that aeromobility infrastructure in the United States at the time seemed to reproduce patterns of terrestrial infrastructure, meaning that aeromobility had not yet become a necessary alternative to, for instance, train travel — that it was still a luxury that shortened the duration of old paths, instead of opening up new paths between places once unlinked. In Central America, on the other hand, they note that, “air transportation is so much easier and faster than surface travel, that it has become a necessary item in the carrying out of normal day to day activities” (320). They identify yet another pattern — one of sparse air service availability, as in southern Argentina — where regional surface-transportation infrastructure is adequate yet the economic level of its inhabitants cannot support aeromobility infrastructure. Taaffe (1956) offers a similar depiction of air passenger network patterns and hierarchies for cities in the United States during this pre-jet era. He also finds a tight association between terrestrial urban characteristics (e.g., urban population, rail service connections) and those of the developing aeromobility network.

Recent air travel network literatures have also considered how we might better classify nodes and networks based on the patterns of aeromobility they express. Van Nuffel et al. (2009) illustrate how considering polarization when discussing the structure of city-regional air traffic hubs allows us to further refine our understanding of where they fit in the overall network hierarchy. The authors consider polarization — whether a city-regional node's linkages are (un)evenly distributed throughout its immediate network — when comparing or determining

23 The authors conducted a related study (1953) on aeromobility access for Europe, Africa, Asia, and Australasia.
city-regions within a network hierarchy. For instance, Cologne (Germany) and Riga (Latvia) handle similar numbers of destinations and passengers. But the bulk of Cologne's passengers concentrate within a handful of routes (giving it high polarization) while Riga's are more evenly distributed throughout its entire network (giving it low polarization).

**Relating Aeromobility and Immobility**

Geographers and researchers from related fields of study, including urban and regional studies, first considered the terrestrial implications of aerial spatial production beginning in the 1930s, with case studies of air transportation in Latin America (Wilcox, 1930) and the area of the Gulf of Mexico and the Caribbean Sea (Pollog, 1937). Aerial-geographers of the mid-twentieth century also produced book-length treatments of the general relationship between air travel and terrestrial socioeconomics (Renner, 1942), the political-economy of aerial linkages (Van Zandt, 1944; Taaffe, 1956, 1959), and a more comprehensive set of aerial-geographic factors (Sealy, 1957). Sealy (1967) also authored an influential article in the *Geographical Journal*, entitled “The siting and development of British airports,” from which we get an early reminder of how one might address the profound expanse and range of urban aerial space:

> It is impossible for me to discuss the whole field of airport development, and I shall be mainly concerned with the pattern of airports as a whole, together with some aspects of individual airports.

His 1967 survey of the British airport system is perhaps the earliest representative of an interdisciplinary field we might today call *airport studies*.

Beginning in the 1970s and 1980s, another interdisciplinary research community began grappling with many of the harmful sociospatial effects of normal and intended aerial-spatial processes, including aeromobility. In contrast with more recent scholarship into aerially-enabled surveillance and control, most of the aerial geographies from this era examine issues related to the economic geographies of airport operations (Adams, 1971; Hoare, 1974; Cruickshank, 1981; Raguraman, 1986) and aircraft noise (Wrigley, 1976, 1977; Harvey et al., 1979; Taylor, 1984;
Taylor et al., 1980, 1987; Feitelson, Hurd, and Mudge, 1996; Espey and Lopez, 2000). Airline deregulation, the availability of air transportation data, and the introduction of the *Journal of Transport Geography* contributed to the rapid rise of similarly-focused aerial-geographic scholarship throughout the 1990s (Vowles, 2006).

More recently, Peter Adey and others have explored the consequences of *air-mindedness* for terrestrial dwelling. These geographers and sociologists have developed critical, alternative geographies of air travel, including *affective geographies*, which conceptualize air travel and air-mindedness as new vistas of human experience (Adey et al. 2007; Budd 2011), and geographies of surveillance and control, which describe airport surveillance systems as reproductive and expressive of broader social inequalities (Dodge and Kitchin, 2004; Adey, 2004a; 2004b).

Aerial-geographies have developed in the wake of the so-called ‘spatial turn,’ a period spanning the past two or three decades, during which the spatially-oriented narratives and practices of geography have propagated throughout other academic disciplines traditionally reliant upon historicist narratives and practices. Warf and Arias (2009) argue that this disciplinary cross-pollination has yielded

> a reworking of the very notion and significance of spatiality to offer a perspective in which space is every bit as important as time in the unfolding of human affairs, a view in which geography is not relegated to an afterthought of social relations, but is intimately involved in their construction. Geography matters, not for the simplistic and overly used reason that everything happens in space, but because where things happen is critical to knowing how and why they happen. (1, original emphasis)

The ‘spatially-turned’ *hows* and *whys* that have taken root across numerous fields of critical inquiry, including that of aerial geography, owe their cultivation to post-Heidegerrian social theorists, including network theorists (e.g., Castells and Massey), Marxist geographers and sociologists (e.g., Harvey, Lefebvre, Castells, and Soja) and social theorists who critique modernist practices, especially of surveillance and control (Foucault, Deleuze, and members of the Situationist movement). The work of these and associated thinkers has given us numerous
alternatives to the absolute spatial ontologies of the Enlightenment, which conceived of objectively-knowable containers and spatial planes within and upon which we can observe (and therefore measure) interactions taking place. Post-Heideggerian critical theorists have instead understood space as a relational social-production, wherein one cannot conceive of any conceptualization of space apart from relations among people, objects, or events.

In examining the historical development of Los Angeles's aerial linkages with the rest of the world — and the institutional (and cultural) forms that govern their performance — I draw upon the a body of research that has followed in the wake of yet another turn: ‘the mobility turn’ (Urry, 2000). Just as the spatial turn has infused spatial narratives throughout an overly-historicist social science tradition, the mobility turn has done the same for narratives of mobility and immobility within a social science tradition that has “failed to examine how the spatialities of social life presuppose...both the actual and the imagined movement of people from place to place” (Sheller and Urry, 2006). Many of the conceptual innovations within the mobility turn began as ideas within the new mobilities paradigm, an interdisciplinary approach to unpacking the dialectical relationships between spaces of immobility and those of mobility. In aeromobilities research, this unpacking focuses on the relations between grounded, terrestrial infrastructures (however defined) and the distant aerial linkages whose performance they enable (Hannam et al., 2006; Sheller and Urry, 2006; Budd, 2011).

Social scientists working within the mobilities paradigm have often explored the causes and consequences of uneven mobilities, much as geographers have explored issues of uneven spatial development. Ogburn's The Social Affects of Aviation (1946) — which predates contemporary mobilities research by almost forty years — imagines a future in which personal aircraft meet the transportation needs of most people, enabling individuals and families to make trips of any length in less time and with less trouble than automobile travel. In part because he wrote it in the decade before the so-called jet age, Ogburn underestimated the speeds, distances, altitudes, and commercial forms of future air travel. He also failed to envision how aeromobility
could empower certain groups — members of a ‘kinetic f’ — to circulate throughout air transportation networks while forcing members of a ‘kinetic underclass’ to endure longer wait-times, intrusive forms of surveillance and control, and identification as a potential 'security risk' (Adey, 2004; Sparke, 2006). By focusing on mobilities and immobilities, or moorings, researchers working within the paradigm have examined how state and multi-state actors have leveraged the rhetoric of air-travel and access — e.g., ‘open skies’ and ‘smart borders’ — both to attract members of the kinetic elite and to control and manage their own citizenry, as in the case of many Caribbean countries (Sheller, 201024). The emphasis mobilities research places upon teasing out the tensions between mobility and immobility can therefore reveal how aeromobility is “intricately tied to relations of power and domination that both produce and shape forms of mobility” (Lassen, 2006: 309).

Conceptions of Airspace and Aerial-Spatiality

Another conversation within mobilities research focuses on the ‘non-place’ discourses surrounding airports and other facilities (e.g., gas stations, hotels, and parking garages), which — through their ubiquity within, and super-identification with, multiscalar global networks — seem to float placelessly above their local sociospatial contexts (Augé, 1995). Adey, Budd, and Hubbard (2007; 774) argue that airports and other landscapes of aeromobility have created new human experiences — new ways of seeing, moving through, and describing the world — that, far from floating placelessly, are affective of the narratives travelers, pilots, airport users, and other urban dwellers create for themselves and the places they move through or inhabit. Instead of identifying airports with transience and the global monoculture, these researchers have described airports and aeromobilities landscapes as an *Aviopolis*, constituted by a “mix of multiple forms

24 See also Sparke's (2006) related discussion on the governance of border crossings among the NAFTA signatory states.
of life,” and constitutive of an air-minded nationalism or an aerially-informed conception of the urban landscape (Fuller and Harley, 2004; Billig, 1995; Adey, 2006, 2010). Airport authorities often market or imbue airport facilities with identities expressive of their local spatial contexts (Simmons and Caruana, 2001). Bob Hope and John Wayne Airports, for example, trade on and reinforce their region's central position within the entertainment industry. These airports and others in the region contain design elements, art installations, and other educational exhibits that superimpose sociocultural narratives of the adjacent Los Angeles region within the space of the airport (Cosgrove, 1999). Politicians and airport boosters within Los Angeles and other regions have appealed for airport expansion or new airport construction using a rhetoric of local, regional, or national pride and prestige (Simmons and Caruana, 2001).

Authors who begin from Augé's 'non-place' conception of airports and airspaces often ignore how these facilities and surrounding landscapes embed within multiscalar arrays of networked infrastructures, public and private institutional arrangements, and nested chunks of software code (Salter, 2008; 9; and Dodge and Kitchin, 2004). Fuller and Harley (2004; 40) note, too, that the techniques and technologies of the airport are increasingly applied by authorities within the surrounding urban region, and that airport facilities themselves have likewise assumed many urban regional functions (cf. Gottdiener, 2001; Pascoe, 2001; and Hannam et al., 2006). In the case of airport-to-city technology transfers, the airport has become “a surveillance machine — an assemblage where webs of technology and information combine” (p. 1375), extending the influence and reach of security functions performed by institutional actors within adjacent urban space:

The use of technologies such as detention centres, CCTV, Internet cafes, GPS systems, iris-recognition security, WiFi hotspots and intermodal traffic interchanges are first trialled within airports before moving out as mundane characteristics of cities, places of fear and highly contingent ordering within the new world disorder. And daily flows through airports contribute immensely to the production of contemporary urbanism, including diasporic cultural communities, "ethnic" restaurants and neighbourhoods, distant families and cosmopolitan
identities, and exclusive zones and corridors of connectivity for the fast-tracked kinetic elite. (Hannam et al., 2006; 6-7)

Researchers working within the new mobilities paradigm focus their inquiry on the dialectical relationship between mobility and immobility, and its production of new sociospatial configurations — new modes of human affect and new forms of urbanization (Beckmann, 2001; Urry, 2003; Adey, 2006). Part of what makes aeromobilities so attractive within mobilities research and geography is the scope and scale of its configurative processes. Systems of aeromobility intensify global activity within the territorial spaces of the airports and relate local territorial interests throughout a global network; producing an aeriality that is “central to the making of the new global dis/order” (Urry, 2008; 25). They create new sociospatial configurations, having produced novel and intensified territorial usages (Fuller and Harley, 2004), as well as expanded forms of relationality. Borgstrom (1974), too, earlier recognized the capacity for aeromobility to produce “a new post-world order.” Many aeromobilities researchers have therefore rejected the 'non-place' conception of airports, instead recognizing these places as situated or enfolded within “at least thin networks of connections that stretch beyond each such place” (Urry and Sheller, 2006: 210).

By refocusing the discussion on the sociospatial effects of aeromobilities, mobilities research allows us to consider airspace as we would a physical networked-infrastructure. This move has inspired several explorations of airspace(s) over the past fifteen years which have gradually established a conception of airspace as a site of differentiated performance, produced and occupied by the overlapping spatial practices of a range of social actors (Pascoe, 2001; Urry, 2003; Adey, 2006b; 2007; Adey et al., 2007). One goal of these explorations has been to map the politics of “what lies above us” so that we may bring “it under democratic control” (Cwerner et al., 2009; x). To that end, researchers have critically mapped airspaces produced by military
(Williams, 2011; Adey, 2010) and civilian activities (Pascoe, 2001; Budd, 2009)\textsuperscript{25}, state territorial maintenance (Dienel and Lyth, 1998; Kyriakides 1998), national prestige or international competition (Adey, 2006a), and geopolitics (Graham, 2004; Kaplan, 2006; Weizman, 2002; Williams, 2010). Dodge and Kitchin (2004, 198) have conceptualized airspace as a continuously-enacted site that emerges from the dialectical interplay of “the materiality of air travel and its software and data.” The new mobilities paradigm allows researchers to set aside issues of scale in favor of approaches that 'build-up,' or infer, novel sociospatial conceptualizations as they become constituted through the ceaseless dialectic between mobility and immobility. Thus, conceptualizations of airspace may also include the spaces produced by surveillance and control measures ostensibly designed to prevent hostile acts performed within an extra-regional, extra-territorial airspace — “a state within a state” — established by international agreement, managed by air-traffic and other control systems, bordered by airports, and populated by “the traveling public” (Pascoe, 2001; 11-14; cf. Ballard, 1997).

\textbf{Analyzing Los Angeles}

Many researchers, primarily within geography and urban studies, have engaged with Los Angeles to address a wide range of theoretical questions related to the political, economic, and social matters of a twenty-first century — or prototypically postmodern — city-region. These researchers are often labeled (and have often labeled themselves) members of the “Los Angeles School” of urban studies (cf. Dear and Flusty, 1998; Soja, 1989, 1996; Scott and Soja, 1996). These theorists apply a diverse range of theoretical and epistemological methods within their work, unified if at all through a reliance on post-structuralist and critical-social theory, particularly as conceived by authors seeking to understand urban sociospatial dynamics and

\textsuperscript{25} Also see all articles in \textit{Mobilities} (vol. 6; no. 1) that consider the transformation of mobilities/immobilities in the wake of the 2010 volcanic eruption of Eyjafjallajökull, in Iceland.
uneven spatial development (cf., Lefebvre, Foucault, and early Castells). For the purposes of this research, however, I focus the following section most particularly on the aspects of Los Angeles city-regional sociospatiality that relate it most intensely with the atmosphere. On this count, Los Angeles offers us a rich terrain on which to explore questions of aeriality that might apply to other city-regions that are expanding and intensifying their relationship with aerial space through massive infrastructural investments, including Dubai, Singapore, Beijing, and Shanghai. In *Globalizing L.A.*, Stephen Erie (2004) describes how the Los Angeles city-region managed to become one of the largest urban economies in the world primarily through massive investments in public infrastructure, including Los Angeles International Airport and others within the regional airport system. In a distillation of the broader infrastructural development processes that defined postwar Los Angeles, Kasarda (with Lindsey, 2010) has advocated that urban regions reorient local economic relations around their capacities for aerial-spatial production.

Most of the airports in the Los Angeles city-region owe their initial construction or subsequent development to the military-aerospace industry, particularly since the beginning of the Second World War. From 1940 to 1978, Lockheed, for example, owned and expanded what is now known as Bob Hope Airport (BUR). Palmdale Regional Airport (PMD) shares its (dormant) facility with Air Force Plant 42, which houses Lockheed Martin's 'Skunk Works' and other top-secret “black aviation” manufacturing programs (Paglen, 2010). The region is also home to operational United States Air Force facilities, including Edwards Air Force Base, its primary proving 'ground,' and Riverside's March Joint Air Reserve Base, once a major center for Air Force operations during the Cold War, and now less intensely used for military logistics activities and civilian general aviation traffic.

In the wake of Base Realignment and Closure (BRAC) throughout the late-1980s and 1990s, numerous decommissioned military facilities in the region have acquired new functions. After closing Victorville's George Air Force Base in 1992, for example, the Air Force leased it to the Southern California Logistics Airport Authority, where it continues to handle military
logistics flights as well as general aviation traffic and limited commercial operations. Marine Corp Air Station El Toro, once the west coast center of United State Marine Corps aviation operations, closed in 1999 and is in the process of being converted into the municipally-owned Orange County Great Park. Facilities such as these serve also as infrastructural reminders of the region's unparalleled reliance upon, and contributions to, aircraft manufacture, and thus of aerial space itself.

Between the First and Second World Wars, Los Angeles-based companies, including Douglas Lockheed, Hughes, and Northrop, contracted with the United States government to develop military-aerospatial technologies. Edwin Clapp and other city boosters of the 1920s envisioned Los Angeles as the “Detroit of the aircraft industry” (Lotchin, 1992; 64). The city-regional economy soon realized his vision. As early as 1938, some 60 percent of American aircraft manufacturers had based their operations in Southern California (Lotchkin, 1992). Manufacturing jobs in Los Angeles increased by hundreds of thousands of jobs per decade from the 1940s to the 1970s — with 250,000 new jobs in the forties, 400,000 in the fifties, 200,000 in the sixties, and 225,000 in the seventies — before finally declining during the 1980s (Soja, Morales, and Wolff, 1987). Much of the postwar explosion of manufacturing jobs can be attributed to civil- and defense-related aerospace technology manufacture, so that “by 1960 aerospace industries employed...60 per cent of Los Angeles's manufacturing workers” (Dear, 2000; 58). A study by the City of Los Angeles found that as late as 1962, 43 percent of manufacturing jobs in Los Angeles and Orange County depended “on government aerospace contracts either directly or indirectly” (Lotchin, 1992; 65; quote originally from City of Los Angeles, 1976). When these and other manufacturing jobs fled throughout the 1980s and 1990s, they were eventually replaced with lower quality employment opportunities:

between 1983 and 2001, the unemployment rate in Los Angeles County fell from 9.7 percent to 5.7 percent — but during this period, 238,000 higher-paying manufacturing jobs were lost and 765,400 lower-paying service jobs were gained. (Ruchelman, 2007; 93)
The terrestrial-spatial form and social process of the Los Angeles region has emerged in dialectical relationship with the rapid growth of manufacturing jobs during the middle of the twentieth-century, the parallel intensification of automobile usage, and the extensive spatial distribution of innovation based research and manufacturing clusters (Soja, 1989). Though the sprawling spatial-form of the Los Angeles city-region expresses automobility above all else, the social and economic relations of the city are equally, if not more so, the products of military aircraft manufacture and operation.

If the terrestrial configuration of the Los Angeles airport system has emerged from material spatial practices related to the (largely historical) manufacture and operation of military aircraft, the configuration of city-regional aerial linkages has emerged from those practices which produce and reproduce Los Angeles as an intensification of global capital flows. Los Angeles is in that sense a 'developmental city-state,' whose municipal actors have assembled powerful city-regional bureaucracies, at once formally autonomous from the private sector while also driving of economic and infrastructural developments that directly benefit it (Erie, 2004; cf. Evans, 1995). Throughout the twentieth-century, “Los Angeles has made infrastructure the centerpiece of municipal governance” (Erie, 2004; 30). With regard to aerial-enabling infrastructure, the city's Department of Airports (called Los Angeles World Airports, or LAWA) has been the primary vehicle for city-regional management and investment in the spatial forms and social processes which produce (mostly transpacific) commercial aeromobility (Erie, 2004; 30).

Since the 1960s, LAX has become a knot of aerial-related activity. It was the sixth busiest passenger airport in the world in 2010 and the third busiest airport in the United States by freight value (as of 2008). Commercial passenger and cargo traffic gluts at LAX led to the city's purchase and development of Van Nuys Airport, specially designated to handle much of the region's noncommercial, general aviation traffic. It has since become one of the busiest general aviation airports in the world, enabling nearly 4000,000 aircraft operations per year (LAWA,
2012). Four other commercial airports in the Los Angeles region play significant hub or destination functions in domestic and regional air passenger networks, including the LA/Ontario, Long Beach Municipal, John Wayne, and Bob Hope Airports.

Setting aside the terrestrial legacy of military aircraft manufacture and operation, as well as its position within networks of national and international commercial aeromobility, the Los Angeles city-region still remains one of the densest concentrations of aerial-related urban activity or concern anywhere in the world. Its infamous smog has contributed over the past seventy years to countless deaths and illnesses, roadway accidents, evacuations, grounded aircraft, and, in 1947, the country's first unified air-pollution regulatory agency (Jacobs and Kelly, 2008). Automobile and air traffic associated with Los Angeles International Airport make it the region's third largest source of smog (Erie, 2004; 216). Tellingly, future visions of Los Angeles often extrapolate or merge the urban region's current intensity of aerial and terrestrial traffic, conceiving of a regional future bound within a dense tangle of aerial transportation networks, as depicted in Blade Runner, Demolition Man, and the Back to the Future franchise.

The following chapter begins to untangle and describe one strand of aerial traffic constituting contemporary Los Angeles: the aerial connections between LAX and other commercial passenger airports around the world. Specifically, the chapter introduces one approach for measuring aeriality, addresses the distribution of airline passengers over distance from LAX, and discusses the shifting position of Los Angeles within LAX-mediated air travel networks.
Chapter 3

AERIAL CONNECTIONS VIA LAX

I know the whole world is watching, and I wish the whole world could see what I see. Sometimes you have to go up really high to understand how small you really are.

— Felix Baumgartner, moments before his 24-mile spacedive (2012)

It was a thrilling experience to be whizzed in a “lift” a quarter of a mile heavenward, and to see New York spread out like a marvelous tapestry beneath us.

There was the Hudson – more like the flash of a sword-blade than a noble river. The little island of Manhattan, set like a jewel in its nest of rainbow waters, stared up into my face, and the solar system circled about my head! Why, I thought, the sun and the stars are suburbs of New York, and I never knew it! I had a sort of wild desire to invest in a bit of real estate on one of the planets.

— Helen Keller, in a letter describing what she “saw” from the top of the Empire State Building (1932)

Because of its relatively rapid capacity to reply in terms of supply and demand, air traffic provides a pertinent indicator in the quest to evaluate the international character of western European cities.

— Nadine Cattan (1995)

Introduction

Two simultaneous occurrences from October 2012 illustrate some central themes within *aerial urbanism*, an emergent interdisciplinary field of analysis and research which takes everyday life in our cities not only as a form of dwelling on-the-earth but also in-the-air. The first of these events, Felix Baumgartner's *Stratos* spacedive, occurred for nearly ten minutes on the
morning of October 14th. The second began two days earlier, as local-, state-, and federal officials assisted in the 62-hour movement of Space Shuttle Endeavour through the crowded streets of Los Angeles, from LAX to its new home as an exhibit at the California Science Center.

We increasingly take for granted air travel as a set of techniques — and the aerial realm as a *technological zone* (Barry, 2006) — which condition and enable the global economic order. The large-scale production of aerial space for passenger air travel has radically reconfigured the relationship urban dwellers share with local, as well as distant, urban places. The materialities of aerial-spatial production forces us to reconceptualize our cities, nations, and selves to accommodate the distortions of spatial relationships produced by the vast ranges and fast speeds of jet airliners, the fluctuating costs of jet fuel, the capacity of airports, the management of air traffic, and the regulation of the air travel. Within our everyday urban lives, these distortions occur most intensely within airport facilities, which,

enact another way of thinking about global relationships. They quite literally operate through a 'network logic' that cuts across the categories of nation states and territory, humans and animals, products and machines, and material and informational modes of mobility and reconnects them in new relationships to each other. (Fuller and Harley, 2004; 39)

Emergent — occasionally, only momentarily occurring — aerial sites and practices can help us more fully comprehend the intensities of control and the scales of influence exerted upon the everyday lives and places of urban dwellers by the sites and practices of the more regular, larger-scale aerial-spatial production, particularly those associated with passenger air travel. By paying attention to the categorical blurring and reconnections that attend these emergent modes of aerial-spatial production, we can better identify the gulf that exists between on one hand, the condition of the atmosphere and its aerodynamics, and, on the other, our imposition of structures and practices making use of these. Baumgartner's spacetravel, for instance, points to the aerial as an urban realm on one hand the province of sociotechnical control structures and, on the other, of ungovernable physical forces: of both the national air traffic control system and terminal velocity
— of both the Outer Space Treaty and the wild friction heat (3,000 °F) of atmospheric re-entry. The shuttle movement offers a literal illustration of aerospatial production and its effects on the physical form and social processes of city-regions.

Baumgartner's Red Bull-sponsored spacedive began when professional daredevil Felix Baumgartner jumped from a balloon floating more than 24-miles — 127,852 feet — above the New Mexican desert. During his 4-minute, 19-second free fall, Baumgartner became the first person to exceed the speed of sound without vehicular assistance. He achieved Mach 1.25 (attaining a speed of 843.6 mph) during a free-fall distance of 119,431 feet (Amos, 2013). Though he also surpassed the old record for highest manned balloon (by some 4,000 feet, no less), his long, slow ascent remained mere background for his spectacular descent. The going into space portion of Baumgartner's stunt was therefore reduced to setup — mere introduction: the climb to the highboard diving platform. I tuned in only minutes before he crawled from the capsule and began the spacedive itself. If Armstrong's was a small step for man but a giant leap for mankind, Baumgartner's was a giant leap for man but a small step for mankind. Nevertheless, his fall did indeed illuminate a key aspect of our relationship with the atmosphere.

The attention paid Baumgartner's dive, both by its corporate sponsor and a worldwide audience in the millions, contrasts sharply with the unobserved, unremarked-upon processes by which we more regularly move through the atmosphere. When it comes to air travel, for instance, what has become foreign to our senses — thus, what has become truly spectacular — is not our carefully governed production of aerial space but rather our uncontrolled, ungovernable productions of the same. In contrast to other aeronautic spectacles (e.g., early barnstormers, Lindbergh's solo crossing of the Atlantic, the moon landing) Baumgartner's stunt serves neither

26 It is worth noting here that Red Bull's corporate slogan is “Red Bull gives you wings.”

27 Baumgartner achieved this distinction 65 years to the day after Charles Yeager became the first person to exceed the speed of sound with vehicular assistance, on October 14, 1947.
to celebrate humankind's recently-acquired capacity for flight nor to demonstrate the limits of our instruments. It does not inspire. The spacedive serves instead as a reflection (in this case, a literal *bending back* 28) upon our efforts to normalize those practices by which we produce aerial-space.

Baumgartner subverts the structures of regulation and governance which pervade aerial space so effectively they often force us to forget they exist at all. He demonstrates that any practices which produce aerial-space must constantly contend with a set of physical forces (e.g., gravity, friction) whose consequences differ radically from how we experience these forces in our terrestrial experience. The systems, equipment, and actors involved in passenger aviation come together to ensure that our encounters with(in) the sky become constantly mediated through a massive and continuously-negotiated regulatory assemblage, whose political outcomes dictate everything from the degree to which 757s may execute a bank, to the slope gradient of runways, to the amount of rest a flight crew must receive, to the acceptable waistline of a single-seat passenger. In fact, there has only been a

small fraction of humanity who have actually experienced air travel *qua* air travel, as a mode of transport distinct from old ones. These include fighter pilots, astronauts and the few air travelers who have been part of a serious emergency that forced (for instance) an airliner to lose 10,000 feet of altitude in a few seconds (Rao, 2012; no pagination)

Add to that list Felix Baumgartner, who experienced in spectacular fashion air travel *qua* air travel. Through the web-based livestream of his *Stratos* spacedive, Baumgartner demonstrated the human experience of air travel virtually free of institutional regulation and control. 29

28 Reflection comes to us from the Latin *reflectere*: re- “back” + *flectere-* “to bend”

29 Though Baumgartner performed the actual dive without institutional constraints, the cost and scale of the entire spectacle all but required corporate sponsorship. To that end, the Red Bull logo was emblazoned across the ascent capsule, along with Baumgartner's helmet, spacesuit, and parachute. Presumably, Baumgartner and his crew also needed required authorization from the FAA and other authorities for the use of New Mexico's airspace.
Meanwhile, not quite a thousand miles away, the new owners of the Space Shuttle Endeavour continued wheeling the retired craft along Los Angeles's MLK Boulevard on a slow parade from LAX to its final home at the California Science Center. The 12-mile long, three-day journey required over a year of planning and coordination between the Science Center, Los Angeles city government, and residents of communities along the route. The New York Times (Lovett, 2012) summarized some outcomes of this process on the local landscape:

Hundreds of trees were cut down so that the shuttle could make the trip in one piece, angering many residents of South Los Angeles who worried their neighborhood would be left barren. A deal to avoid a lawsuit was reached just a few weeks ago.

Street signs have also been removed; thousands of steel plates have been placed on the road to protect water and sewer pipes underneath from bursting under the shuttle’s weight; and several major power lines along the way were to be temporarily taken down.

The California Science Center required the shuttle make its journey in one piece. The organization's website claims this is because “NASA cannot safely separate and reattach the wings or the tail without the infrastructure that is provided in the orbiter processing facility” (2012, no pagination). The Endeavour finally came to rest in the Samuel Oschin Space Shuttle Endeavour Display Pavilion, bearing no signs of its extensive (and expensive) crawl through Los Angeles, having transferred these effects to the city itself, in the uprooted trees and disrupted lives of those in affected communities, but also in the impromptu gatherings which the shuttle inspired:

While the Endeavour stayed parked in the lot near the airport, through the early afternoon as engineers prepared for the next phase of its journey, a makeshift festival cropped up around it. ... Grown men jumped up and down in excitement. And nearly everyone — including some of the police officers charged with keeping the shuttle safe — had a camera perpetually pointed toward the spacecraft, making it impossible to walk anywhere without ruining a photograph. (Lovett, 2012)
The terrestrial movement of Endeavour offers us an entry point for considering the relationship between terrestrial- and aerial-spatial production. Through this relationship, urban life has become continuously reconfigured as a result of aerial-enabling processes that disassemble, or unbundle, local infrastructures (Graham and Marvin, 2001), in order to assemble novel social arrangements, emergent from structures of (aerial) connectivity (Sheller, 2005). The movement of the aircraft through the streets of Los Angeles makes explicit the relationship between the aerial and the terrestrial as one in which the capacity to connect people and places can also become the capacity to disrupt. Furthermore, the space shuttle made its journey intact, being neither dismantled in part nor wrapped in whole with a bulky protective cushioning. This served to preserve its iconic silhouette as it inched, nose-forward, along the city streets, maintaining a simulacrum of air travel and thereby drawing attention to Los Angeles as a city-in-the-air, and its terrestrial residents as beings-in-the-air.

The morning of October 14th, 2012, thus gave us two events that ask us to consider our cities and ourselves in relation to aerial-spatial production. Baumgartner's spacedive offered a jolt of unadulterated, elemental aeriality, which called attention to the constructed-ness of aerial governance regimes. The movement of Endeavour through Los Angeles gave us an easily-traceable, slow-motion depiction of the terrestrial effects — whether disruptive, celebratory, banal, or otherwise — which constantly attend aerial-spatial production. These two remarkable and coincidental events point, on one hand, to the materiality of air and aerial-spatial production and, on the other hand, to its role in conditioning urban life. We can apply these insights to guide our use of more routine experiences with aerial spatial production to better understand how social forces relationally-configure the Los Angeles city-region as both aerial and terrestrial node.
Measuring Aeriality

The contemporary aviation industry (including airlines, airports, and regulatory agencies) rely upon some combination of three primary measures for representing the dynamics of passenger aerial sociospatiality. These include measures of aircraft movements, seat capacity, and passenger traffic volumes. Of these, passenger traffic volume is the most widely cited, likely because it illustrates actual system usage, whereas the other two measure only its available capacity. We can also understand the efficiency of particular systems or routes using passenger load factor, a commonly-cited ratio of passenger traffic to available capacity.

Despite the absolute dominance of LAX within the Los Angeles city-regional system, the other airports in the region have actually experienced higher relative growth in passenger volumes since 2001 (Figure 5).

![Figure 5](image-url)  
**Figure 5**  
Growth since 2001 of LA Regional GDP and Air Passenger Volumes
Figure 5 suggests three trends in regional passenger and economic growth since 2001. The first pertains to real GDP growth for the Los Angeles region\textsuperscript{30} and suggests that growth remained a relatively consistent four-percent or so until 2006, when it leveled-off from 2006 to 2008 before declining with the rest of the global economy throughout 2008 and rebounding slightly during 2009 (real GDP data since 2010 is still preliminary). Real GDP growth for the region far outpaced the trend line below, which depicts the growth since 2001 of air passenger volumes for LAX in particular. The growth trend indicates an almost ten-percent loss for 2002, largely reflective of the drop in airline passengers experienced industry-wide after September 11, 2001. Despite a recovery to pre-2001 levels in 2004, LAX passenger volumes remained relatively flat over the next five years. Since reaching a post-2003 low (in 2009), passenger volumes at LAX have risen about five-percent each of the past two years. In contrast to the relatively stagnant LAX passenger volumes, those at the region's other airports have outpaced real GDP growth. Taking the secondary airports in the region as a single volume of passengers, it is almost as if the 9/11 that so affected LAX (and nearly every other major airport in the United States) never happened. The volumes here grow by over five-percent in 2002, by over ten-percent in 2003, and over fifteen-percent by 2005, before peaking in 2007 and contracting during the subsequent economic crisis. These airports owe their rapid growth from 2003 to 2007 primarily to the strengthening position of low-cost carriers, such as Southwest Airlines, which often prefer the lower fees of secondary airports (e.g., BUR and ONT) to the convenience and high fees of primary airports, such as LAX.

\textsuperscript{30} Here, I have defined the Los Angeles region as consistently as possible with previous definitions using the combined areas and data for US Census Bureau MSAs. See Appendix A for a more detailed discussion.
Strategy Landscapes

Two broadly-defined historical phenomena — one a political process that has already taken place; the other, an ongoing process of global political-economy — frame the production of aerial space. The first, airline deregulation, displaced one set of airline operational strategies with another, forcing air carriers to compete with one another on price in an environment of thin profit margins. The second phenomena, the rapidly escalating price of jet fuel, has further diminished these profit margins by becoming (in most cases) the single greatest cost of operating an airline. Moreover, the volatility of the price of jet fuel keeps air carrier profit margins not only thin but fragile. Both phenomena have forced airlines to alter the shapes and intensities of their networked operations, as well as the equipment and techniques by which they produce aerial space. In the following section, I briefly summarize the historical context for each of these phenomena and describe some outcomes of each that are relevant to the current project.

Deregulating Production

As a result of successful Nixon-era legislation to deregulate surface transportation providers — including the railroad, trucking, and busing industries, the Democratic-controlled senate of the mid-1970s began investigating the potential economic outcomes of airline deregulation. The Ford Administration first publicized its support for airline deregulation in a set of hearings initiated by Senator Ted Kennedy's Senate Subcommittee on Administrative Practice and Procedure. From the beginning, Senator Kennedy's hearings “were designed to depict regulatory reform as an effort to help the consumer and to lessen burdensome regulatory policy” (Breyer, 1982; 320). The hearings thereby elevated the visibility of deregulation among the flying public while also representing it as a populist issue, a move designed to make opposition to deregulation less tenable for many liberal Democrats allied with proponents of the regulatory regime, including organized labor.
Under the regulatory status quo, incumbent airlines enjoyed federal protection against new entrants to the market, who required formal certification from the Civil Aeronautics Board (CAB) before they could provide service along any given route.\textsuperscript{31} The incumbents airlines, however, also required CAB approval for changes to their route structure or fares. These two sets of regulatory policies reduced competitive pressures among incumbent carriers while also discouraging them from making radical changes to networks and fares. The regime disincentivized airlines from competing on price. Carriers instead competed largely on quality-of-service, leading many carriers to increase flight frequency along certain of the busiest routes in order to reduce the number of passengers per cabin. (And those of us who have ever had an entire row to ourselves on an undersold cross-country flight know that operating inefficiencies such as these come not without their luxuries.) The airline industry, in conjunction with federal regulators, therefore operated as a de facto cartel, enabling the airlines to take greater profits than had they competed on fare price.\textsuperscript{32} Organized labor supported the regulation because it shared in the profit taking.

Following Senator Kennedy’s hearings and the support of both the Ford and Carter administrations, Los Angeles congressman Glenn Anderson finally introduced what would become the Airline Deregulation Act to the floor of the House in 1978. Representative Anderson’s bill would eventually amend the Federal Aviation Act of 1958 so that it placed “maximum reliance on competitive market forces while encouraging new air carriers and

\textsuperscript{31} The market within major “trunk” routes had been closed-off for decades. In fact, “the CAB did not admit any new trunk carrier after 1938” (Barnum, 2005; 50).

\textsuperscript{32} In the field of economics, this situation is known as regulatory capture, a situation in which a regulated industry gains, or “captures,” undue influence within a regulatory agency (Jalilian et al., 2006). Though the agency has ostensibly been created to protect the interests of a relatively powerless, relatively dispersed, relatively disinterested public, it instead serves the interests of a relatively powerful, relatively concentrated, highly-invested set of private interests, which acts to ensure favorable regulatory outcomes for itself, often at the expense of the public interest.
preventing industry concentration” (HR 12611; 1978). In reality, broad, bipartisan support for
deregulation — as well as the political impotence of the airline industry at the time — had
already encouraged the Civil Aeronautics Board to begin relaxing price regulations some two
years earlier (Niskanen, 1989). In the years following its passage into law, the Deregulation Act
guided the federal relinquishment of authority over ticket pricing, route structures, and new
entrants to air service provision: all powers the federal government had invested within the Civil
Aeronautics Board and its predecessor agencies beginning with the Air Commerce Act of 1926.
The half-century of direct federal authorization over the shape of, and access to, domestic air
travel networks gave way to primarily market-based forces. Some forms of regulation remain in
place, however. Airline-related cabotage regulations, for example, prohibit foreign-owned
airlines from offering scheduled passenger service between any two points within the United
States.

The process of deregulation has left us with a landscape marked by several features
relevant to understanding how commercial passenger aeriality has evolved over at least the past
two decades. First, the major air carriers have each pursued strategies to 1) consolidate their
production of aerial space around a tightly-networked core enabled by a set of hub airports, while
also 2) establishing a position in hub airports peripheral to this tightly-networked core for the
purpose of making inroads within the core network of a competitor or competitors (Caves, 1997).
Every major commercial carrier within the United States has a central hub airport, often in which
it locates key assets, such as maintenance and repair facilities, and near which it may locate its
corporate headquarters. From these core hubs — often called fortress hubs, carriers provide
connecting service (along the “spokes” in hub-and-spoke systems) to secondary hubs, from
which the major carriers or their partners and subsidiaries may offer origin-destination service to
focus cities. Frequent air travelers in the United States may instantly associate, for instance,
Delta with its primary hub, Atlanta's Hartsfield-Jackson International Airport (ATL), and
secondary hubs in Detroit (DTW) and Minneapolis-St. Paul (MSP). Or United with Chicago's
O'Hare International (ORD) and Houston's George Bush Intercontinental (IAH). Or American Airlines with Dallas-Fort Worth International. Travelers may have also once associated Northwest Airlines with its core hub, Minneapolis-St. Paul International, before the airline merged with Delta, which now accounts for over 80-percent of MSP passenger volumes.

Owing to “its relatively rapid capacity to reply in terms of supply and demand” air traffic offered a radically malleable terrain, upon which the various political, economic, and social forces associated with aerial-spatial production have ceaselessly reconfigured the sociospatial relationships within and between city-regions. This economic and spatial malleability does not necessarily trend in the direction of growth, however. Air carriers frequently reorganize their ownership and route structures under bankruptcy protection and, in many cases, either dissolve, become acquired by, or merge with other carriers (Figure 6, following page).

<table>
<thead>
<tr>
<th>Year completed</th>
<th>Airline</th>
<th>Event</th>
<th>Second participant, if merged or acquired</th>
<th>New name if merged</th>
</tr>
</thead>
<tbody>
<tr>
<td>1986</td>
<td>Horizon Air</td>
<td>acquired as a subsidiary by</td>
<td>Alaska Airlines</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>Midway Airlines</td>
<td>dissolved after declaring bankruptcy.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>AirTran Airlines</td>
<td>acquired by and merged with</td>
<td>Valujet Airlines</td>
<td>AirTran Airlines</td>
</tr>
<tr>
<td>2001</td>
<td>Canadian Airlines</td>
<td>acquired by and merged with</td>
<td>Air Canada</td>
<td>Air Canada</td>
</tr>
<tr>
<td>2001</td>
<td>Trans World Airlines</td>
<td>merged with</td>
<td>American Airlines</td>
<td>American Airlines</td>
</tr>
<tr>
<td>2004</td>
<td>Air France</td>
<td>merged with</td>
<td>KLM Royal Dutch Airlines</td>
<td>Air France - KLM</td>
</tr>
<tr>
<td>2005</td>
<td>America West Airlines</td>
<td>merged with</td>
<td>US Airways</td>
<td>US Airways</td>
</tr>
<tr>
<td>2009</td>
<td>Midwest Airlines</td>
<td>acquired as a subsidiary by</td>
<td>Republic Airways (Holdings)</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>Frontier Airlines</td>
<td>acquired as a subsidiary by</td>
<td>Republic Airways (Holdings)</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>Northwest Airlines</td>
<td>acquired by and merged with</td>
<td>Delta Airlines</td>
<td>Delta Airlines</td>
</tr>
<tr>
<td>2010</td>
<td>AirTran Airlines</td>
<td>acquired as a subsidiary by</td>
<td>Southwest Airlines</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>United Airlines</td>
<td>merged with</td>
<td>Continental Airlines</td>
<td>United Airlines</td>
</tr>
<tr>
<td>Potential</td>
<td>American Airlines</td>
<td>merging with</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Following Pan Am’s dissolution, Delta Airlines acquired many Pan Am assets & routes.

**Figure 6**  Major airliner mergers, acquisitions, & bankruptcies relevant to LAX passenger service in the deregulated era
The industry is especially susceptible to changes in political and economic conditions, especially those which affect the supply of jet fuel or the demand for air travel. Highly visible or especially deadly air crashes, as well as public fears of hijackings and terrorism can affect the market for air travel, for example, and often independent of the national or international economic climate. Legacy carriers are often constrained by costs associated with pensions and the related effects of strike actions taken by labor unions. The carryover of pre-regulation operating costs for Atlanta-focused Eastern Air Lines, for example, prevented the carrier from ever successfully competing with Atlanta-based Delta Airlines. But, most of all, the fortunes of air carriers in the deregulated era rise and fall with the price of jet fuel. Both Pan Am World Airways and Midway Airlines declared bankruptcy in direct connection with spikes in fuel prices as a result of the First Gulf War, in 1991. The rash of mergers and acquisitions since 2001 was also largely precipitated by fuel cost volatility following September 11, 2001. The following section addresses the effects of these and other price fluctuations in more detail.

Fueling Strategy

The stagnated passenger volumes, though reflective of broader economic trends, also feed back into costs associated with air travel provision. Jet fuel is the single largest component of airlines' operating costs. Any significant and lasting reconfiguration of aerial space made by the airlines themselves — e.g., making more appropriate fits of aircraft to markets, acquiring more efficient aircraft, making efficiency upgrades to current fleets, adjusting routes and frequencies, and adding or dropping service — is largely premised upon managing this central, and highly-variable operating cost, whose volatility is evidence by Figure 7.
In early 1990, a gallon of jet fuel cost about fifty US cents (see Figure 7). For the next decade this price remained relatively stable, excluding the spike that occurred in late 1990 during the run-up to the first Persian Gulf War. Over the past decade, however, its widely fluctuating price has offered us a clear and responsive illustration of just how tightly-integrated aerial-spatial production has become within the global economy. With the plunge in demand for air travel after September 11th, 2001, for instance, a gallon of jet fuel lost about a third of its value, going from 76.4 cents in August to 51.5 in December. The price has skyrocketed since this low, reaching $3.89 in July 2008. After another dip to $1.26 in February 2009, the price has risen to about $3.00 over the past two years, reaching a low of $2.62 and a high just short of $3.30 since January 2011.
Airlines have increased their use of fuel surcharges to recoup the rising costs of fuel, while also employing hedging strategies to manage deep fluctuations in fuel costs. Many airlines have also outfitted their fleet with fuel efficient technologies already in use on newer aircraft, such as drag-reducing devices on wingtips (called winglets), and lightweight carbon brakes, which provide a 0.5-percent fuel savings versus steel brakes on Boeing's most recent update to its 737 series, the best-selling jet airliner in history (Wilhelm, 2008). Some larger airlines and aircraft manufacturers have begun research and testing of alternatives to oil-based jet fuel, including algae-based biofuels. Rising fuel costs and increased demand for air travel worldwide have also enabled niche carriers to maximize profits through their use of outmoded technologies, such as turboprop engines, which are more fuel-efficient and cheaply-maintained than jet engines (Burress, 2012).

Airlines can also recoup fuel costs by employing and improving upon practices for achieving fuller (more crowded) planes. This is done in three primary ways: by reducing flight frequencies, dropping lesser-performing markets altogether, and making more appropriate matches between aircraft (seat capacities) and market seat demand. At LAX, this has resulted in significantly higher passenger load-factors (or PLF: defined, again, the ratio of seats used to seats available) even over the past decade (Figure 8).

<table>
<thead>
<tr>
<th>Year</th>
<th>Seats</th>
<th>Passengers</th>
<th>Departures</th>
<th>Load Factor (PLF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>70,398,576</td>
<td>42,248,087</td>
<td>441,020</td>
<td>60</td>
</tr>
<tr>
<td>1997</td>
<td>87,920,248</td>
<td>58,213,936</td>
<td>520,959</td>
<td>66</td>
</tr>
<tr>
<td>2004</td>
<td>79,667,461</td>
<td>59,511,282</td>
<td>610,961</td>
<td>75</td>
</tr>
<tr>
<td>2011</td>
<td>76,376,175</td>
<td>62,542,423</td>
<td>572,631</td>
<td>82</td>
</tr>
</tbody>
</table>

Source: Author’s calculations based on T-100 market data from the BTS website.

Figure 8 Passenger load-factors at LAX.
There appears to be no consensus on what PLF threshold constitutes practically full utilization of available seats. Among US carriers, however, it appears to have plateaued at 80%, more or less.

It is not unreasonable to claim that the rising cost of jet fuel has been more financially ruinous to the airline industry than was September 11th, 2001. In the six months following those attacks, for example, the IATA reported eight airlines ceased operations. During the six months in the first half of 2008, in the run-up to the July spike at $3.89, the IATA reported 25 airlines ceased operations (AFP, 2008). Whatever the case, the production of aerial space — both its extent and intensity of use — is inextricable from the value of a single commodity, whose production and distribution in turn structures the geopolitical landscape. The next section examines the extent of aerial spatial production centered on Los Angeles — particularly LAX — in comparison with key airports grouped into three types: gateways, western, and Los Angeles city-regional.

**Passenger Distributions over Distance**

**Description of Distance Distribution Tables**

Air-travel distance is one way to measure the spatial interaction between airports. The distribution of passengers across distances traveled can give us an impression of airport operational intensity at various scales (Jin et al, 2004). Figure 9 (next page) is the first in a series of seven tables illustrating the passenger distance distributions from 1990 and 2011 for LAX and other domestic airports, grouped by function and location. These include gateway airports, airports in the Western United States, and airports in the Los Angeles city-region. An additional table compares distributions particular to LAX from 1990 and 2011.
The following section uses Figure 9 — analyzed in greater detail later — to help us unpack the information conveyed within it and each of the related tables. Specifically, the tables depict two components of an airport's passenger operations across space: first, the intensity of its activities relating to particular distances and, second, the volume or scale of its operations relative to other airports occupying similar positions within the network (i.e., gateway airports), or within space (i.e., Western and Los Angeles regional airports). First, the intensity of operations across space is depicted along a horizontal axis composed of 250-mile distance units, beginning with 0–249 miles and extending rightwards to a unit representing 10,000 miles or greater. Second, the volume of operations within each distance unit is depicted along a vertical axis composed of five blocks representing passenger volumes within a logarithmic-scale
beginning with 1,000 passengers (each block represents a passenger volume 10x greater than the block below).

The shaded blocks to the right of each airport therefore each convey three points of data. First, the location along the horizontal axis tells us in which distance unit the passenger relations take place (the *where* of relations). Second, the degree of shading tells us what percentage of each airport's total passenger volumes relate with each distance unit (the *intensity* of relations): the darkest gray (almost black) shade indicates the block's share is 30-percent or greater; the lightest gray shade indicates the block's share is less than 10%; the middle two shades indicate 10–19.9% and 20–29.9%, respectively (see legend beneath Figure 9). Unshaded, white blocks indicate that no passenger exchange takes place. Third, *which* of the five vertical blocks is shaded tells us the volume of an airport's passenger activity at each distance unit (the *magnitude* of relations).³³

Thus, for the four gateway airports (LAX, SFO, JFK, and EWR) in Figure 9 above, we can see that the distance unit for 2,500–2,749 miles is shaded for between 10–19.9% for three of the airports (LAX, SFO, and JFK) and for less than 10% for EWR. This means that a greater percentage of each of the first three airports' *total passenger volumes* relates with the 2,500–2,749 distance unit compared to less than 10% of EWR's total passenger volume. Additionally, we can see that in each of the four cases, this distance unit receives a volume of between one- and ten-million passengers. For the distance unit between 3,500–3,750 miles, there is even greater variation among the four gateways. From the East Coast locations of JFK and EWR, this 3,500–3,750 mile unit contains much of Western Europe. The relationship of LAX and SFO to this unit, on the other hand, is influenced by the vast expanse of the Pacific Ocean, which

³³ An additional thick black line demarcates the approximate median distance unit for each airport: the distance units to the left of the thick line contain more than half of the airport's total passenger volumes. For airports with a flattened passenger distribution, this median line will occur further along the x-axis than for those with a more local distribution.
separates these two gateways from major Pacific Rim destinations by anywhere from about 1,500 to 4,000 additional miles (to Tokyo and Sydney, respectively). Thus, Bogotá, Colombia — whose passenger relationship with Los Angeles has diminished over the past two decades — is the only major market represented by the 3,500–3,750 mile unit for either of the West Coast gateways. The following three sections comprise a more detailed discussion and comparison of the seven distance unit tables for the years 1990 and 2011, beginning with the largest domestic gateway airports, before moving onto a discussion and comparison of the largest airports in the Western part of the United States, and, finally, of the eight commercial airports within the Los Angeles city-region.

Analysis of Distance Distribution Tables

Gateway Airports

The first group of tables includes the one above (now called Figure 10) as well as a counterpart table depicting data from 2011 (Figure 11). These illustrate distance distributions for the four busiest gateway airports in the United States (airports with the highest proportion of international traffic to domestic traffic): LAX, San Francisco's airport, JFK, and Newark Liberty (EWR).
Most remarkably, the four busiest gateway airports are all located on the coasts (Miami's airport just fails to make the top four but it, too, is along the coast). The consistent shading of distance units for all four airports between the 0- and 2500-mile units — and particularly within the 100K+ and 1M+ volume tiers — indicates that despite their gateway status, these airports are
nonetheless primarily oriented towards North American interior air traffic. The less-consistently shaded distance units beyond 2,500-miles, however, illustrate the role these airports play within domestic air passenger networks. That is, they modulate between domestic and international air travel networks. JFK's distributions for both 1990 and 2011, for example, are remarkably oriented towards long-distance, international travel; aside from registering an intense concentration of passengers for the 2,500-distance unit (primarily for West coast airports such as LAX and SFO), air carriers involving JFK distribute passengers throughout a flattened, extensive hinterland, which extends well beyond 7,000 miles — greater than the distance between Newark, Delaware, and Kabul, Afghanistan. JFK is notable among this group for having the most intense relationships with Western Europe, whose approximate locations falls within the two distance units containing 3,500–3,999 miles. For 1990, in particular, nearly 23-percent of JFK's total passengers made use of its direct flights to airports within this distance range — with much of the shared traffic involving Heathrow, Charles de Gaulle, and Frankfurt.

As with JFK's, the distributional pattern for LAX is far more extensive than those of its Western competitors (depicted in Figures 12 and 13, on the following page). LAX diverges from JFK, however, in its connections with airports in the interior of the United States. LAX is the busiest of the four gateway airports with regard to interior airports in large part because it is the only major airport airport in the largest city-region on the Western Coast of North America. Moreover, there are many airports along the East Coast which handle passenger traffic from the continental interior: examples from the Northeast Corridor include BWI in the Baltimore/DC region, PHL in Philadelphia, and Boston's Logan International; in the southeast, the airports of Atlanta and Charlotte offer important links to the interior. These airports serve as hubs to the East Coast gateways of JFK, EWR, and MIA.

LAX currently competes with only San Francisco as a significant transpacific gateway on the West Coast. San Francisco's relations with interior passenger networks are somewhat mitigated by the nearby presence of two medium-sized hub airports, in San Jose and Oakland.
The closest such medium-sized hub to LAX — San Diego International Airport — is over two-hours drive from downtown Los Angeles. Unlike JFK and SFO — which share significant volumes of domestic traffic with other major airports in their regional systems — LAX must itself integrate air passenger traffic from domestic hubs — including Denver, Dallas/Fort Worth, and Chicago's O'Hare — with those of international airports. The most intense concentration of passengers involving LAX relates it to SFO (distance unit: 250–500 miles). The one notable long-distance peak in distributional intensity for Los Angeles comes at 5,500 miles. This is London's Heathrow (LHR). The corridor between LHR and LAX is the second busiest direct route between Europe and the United States (LHR to JFK is the busiest) and the fourth busiest between Europe and the rest of the world.
Western Airports

The second group of tables includes LAX along with the other five busiest US airports west of the Rocky Mountains (including Denver).

**Figure 12** Distance distributions for a selection of airports in the Western United States, 1990
Here, the distributional patterns become more distinct compared with those of the four largest gateway airports. Denver, for instance, connects most intensely with airports at 750–999 miles (the busiest include LAX & SFO), followed by those at 500–750 miles (PHX, LAS, & DFW), and 1000–1249 miles (ATL & SEA). LAS and PHX — hubs for low-cost carriers Southwest (both LAS and PHX), Spirit (LAS), and Allegiant (LAS) — are heavily oriented towards direct connections with airports in the 250–500-mile range. Phoenix shares an intense and 1M+ volume relationships with the 750–1000-mile distance unit, representing its strong linkages with Dallas's DFW, the central hub in American Airlines' network.
In general, the distributional pattern of these Western airports also suggests a domestic or continental orientation rather than the international scope of airports from the previous group. Owing to its heavily-trafficked route to London, LAX and SFO are the only airports among this Western group to have a 1M+ passenger volume peak in a distance unit 2,500-miles or beyond. The remaining airports distribute the highest share of their passengers between 250 and 1250 miles, most especially the units for 250–500 miles (PHX and LAS), 500–750 miles (SAN), and 750–1250 miles (SEA).
Los Angeles City-Regional Airports

The third set of tables depicts the distance distribution patterns of the eight busiest commercial airports in the Los Angeles city-region (Figures 14 and 15).

Figure 14  Distance distributions for commercial airports in the Los Angeles city-region, 1990
Figure 15  Distance distributions for commercial airports in the Los Angeles city-region, 2011

With the obvious exception of LAX, these airports are heavily oriented towards distance units within the 250- to 500-mile range, a range that includes the Northern California cities of San Francisco, Oakland, and Sacramento, as well as nearby low-cost carrier hubs, Las Vegas and Phoenix. The dominant pattern here is the drop-off in international routes. The air traffic involving the seven secondary airports within the Los Angeles city-region is therefore overwhelmingly domestically-oriented, and the international air traffic is overwhelmingly oriented towards continental airports in Canada and Mexico.
During 2011, the four busiest secondary airports in the Los Angeles region — SNA, ONT, BUR, and LGB — offered intensively-traveled routes to:

1. Las Vegas via JetBlue (BUR, LGB) and Southwest (BUR, ONT, SNA)
2. Oakland via JetBlue (LGB) and Southwest (BUR, ONT, SNA)
3. Phoenix via US Airways (BUR, ONT, SNA), Southwest (BUR, ONT, SNA), and its subsidiary AirTran (SNA)
4. Sacramento via JetBlue (LGB) Southwest (BUR, ONT, SNA)
5. San Francisco via JetBlue (LGB), United (SNA), Southwest (SNA), and AirTran (SNA)
6. San Jose via Southwest (BUR, ONT, SNA)

These four airports also supported routes to other Western airports, including:

1. Denver via Frontier Airlines (SNA), Southwest (BUR, ONT, SNA), and United (BUR, ONT, SNA)
2. Portland via Alaska Airlines (LGB) and JetBlue (LGB)
3. Salt Lake City via JetBlue (LGB)
4. Seattle via Alaska Airlines (BUR, LGB) and JetBlue (LGB)

Also noteworthy within this group is the distribution of Santa Barbara’s (SBA) passengers within an immediate 250-mile distance unit. This is because the single busiest route involving SBA relates it as a commuter hub with LAX, only 89-miles away.

Within the hub-and-spoke world of the United States air passenger industry, the busiest airports are commonly located along coastlines, where they enable transoceanic, transnational air traffic networks to interweave with those of national or continental networks. Though the air travel industry extends the commercial influence of city-regions throughout the global air traffic network via direct flight linkages, they most often do so indirectly, by way of gateway facilities such as LAX, JFK, SFO, and EWR. Compared to the patterns from the Western and LA regional groups, the four gateway facilities more evenly distribute departing passengers over a broader
range of distance-groups. Through their integration of, on the one hand, a flattened, globally-extensive hinterland with, on the other, a regional complex of airport-related infrastructure, these gateway facilities more fully realize aeriality as

an 'other space' — a real space that is linked to numerous other types of spaces, contradicting and inverting the sites which it connects. It is not a place that has a defined border, but instead dissolves into a series of modalities that blend into the city — the motorway, the airport rail link, aircraft noise limits, regenerated buffer zones, and the navigational beacons that are fretted across the city landscape. (Fuller and Harley, 2004; 105)

The distance profiles of these facilities, especially compared with those of facilities in the other two groups, illustrate not only their extensive reach but also their intensive distribution: in which they share passenger traffic even with city-regions many thousands of miles away.
As Figure 16 indicates, the global hinterland produced from LAX transformed slightly between 1990 and 2011. The table offers us a side-by-side comparison of the distance profiles for LAX from one year to the other. The 2011 pattern suggests that airlines serving LAX offer service to fewer distance units compared to 1990 (34 in 1990 versus 31 in 2011). Though the table tells us nothing of the sheer number of routes flown within each distance group, this distance unit downsizing does indeed suggest that the connectivity of LAX experienced a change in polarization between the two years being compared (Van Nuffel et al., 2009). Specifically, while the domestic distance profile remained stable, its international profile (the units beyond 2,500 miles) increased in volume, particularly to other gateway airports along the Pacific Rim: the major airports of Seoul, Hong Kong, Auckland, and Sydney all experienced marked increases in the passenger volumes they exchanged with LAX. The increasing polarization of the relationships between Los Angeles and the city-regions at these distance units is likely due to changes in aircraft technology, which have enabled more efficient transpacific travel between
places like Seoul and Sydney to LAX without need for routing through larger markets (Tokyo, in the case of travel from Seoul) or intermediate stopovers (Honolulu, in the case of travel from Sydney). Further refinements in aircraft design — and their gradual adoption by international airlines — will likely allow gateway airports such as Los Angeles International Airport to continue expanding their direct air travel relationships across greater and greater distances, enabling the passenger airline networks centered on the United States and North American to engage in direct exchange relationships with an ever broader pool of potential city-regional partners. There are increasingly greater opportunities for Los Angeles to engage in flexible and dynamic exchange relationships with virtually any other city market via long-haul passenger air travel.

Airlines offering service aboard the longest of these long-haul routes — such as those between LAX and Sydney, Singapore, or Dubai — often maximize their operating costs per mile by using aircraft whose current designs sacrifice either size for engine noise, or engine noise for size. The 747-400 has about two-thirds the weight of an A380 and a shorter wingspan by 60-feet. The A380, on the other hand, has larger, lower-RPM engines, making it half as noisy as the 747-400 (Saporito, 2009). While the 747-400 is capable of using facilities designed for previous generations of jumbo-jets, airlines using the A380 often require airports to make costly facility upgrades or risk losing profitable long-haul service (Weikel, 200). The relative noisiness of the 747-400, however, has greater negative spillover costs for communities beyond the airport perimeter fence. A flattened, expansive distance profile does not come without significant cost, either to the airport itself, its surrounding urban field, or both.

In 1954, Scandinavian Airlines began the first trans-polar scheduled passenger flight in history, offering service between Los Angeles and Copenhagen in 1954. The inaugural flight took place aboard a DC-6B, which took just less than 24-hours to make the 5,800-mile journey, including two planned refueling-stopovers along the way. When the plane finally landed in Copenhagen (seven minutes ahead of schedule), Los Angeles mayor Norris Poulson emerged
from the cabin door carrying a sign reading “Los Angeles City Limits” (Swedish Information Service, 1954). Though Poulson likely intended the city-limit sign to serve as a political symbol — “look how far air travel can take Los Angeles” — it also expressed a sociospatial reality. As the distance profile of Los Angeles becomes flattened and extended by advances in aerospatial technology — thereby expanding its pool of potential city-regional partners for direct connections — the internal functioning of the city-region itself becomes subject to intensifications of the “other space,” in which the gateway function of LAX “dissolves into a series of modalities that blend into the city” (Fuller and Harley, 2004; 105). These most often manifest as the systems designed to speed the exchange of people between airplane and home (or hotel), including multi-lane airport roads, direct rail connections, updated terminals designed to handle more passengers or enable connecting flights, and shuttle services between the airport and nearby hotels or hotel districts. In the area surrounding LAX, this “series of modalities that blend into the city” also includes the Sound Insulation Grant Program, through which the city of Los Angeles and the FAA fund the soundproofing of residences, schools, hospitals, and churches located within a certain, noise-defined range of the airport. 34 As air travel expands the city limits of Los Angeles to encompass ever greater distances, so too does it “reconfigure geography according to the spatio-temporal rhythms and cross-modal standards of global capital, by flattening all difference into manageable, measurable and commodifiable contours” (Fuller and Harley, 2004; 103). Distance profiles therefore illustrate not only the extent of a city-region's aerial footprint, but also provide us with an impression of the intensity of airport-related activity that takes place within its terrestrial footprint.

34 Details of LAWA's Sound Insulation Grant Program (SIGP) may be found at http://www.lawa.org/welcome_LAWA.aspx?id=7331. The residential sound insulation program for LAX has an informational page at http://www.lawa.org/welcome_LAWA.aspx?id=1092.
Los Angeles within Shifting Domestic Aerial Networks

The atmospheric footprint of Los Angeles is evolving and far from static, making it difficult to obtain any sort of lasting insight by looking at air traffic data, from either the distant or recent past. While it remains important to understand the historical patterns and significance of Los Angeles within US airline networks, in the current era — particularly since the post-9/11 collapse of domestic air travel — Los Angeles as an air traffic node has gradually pivoted away from its role as generalized international gateway, becoming a highly-specialized, central node within the air passenger networks relating North America with Asia and Australasia.

In a later section, I offer a discussion of this pivot as it has developed over the past two decades. But first, I would like to address in this section an emergent trend which promises to reconfigure the position of the Los Angeles city-region as a node within both domestic and international air passenger networks. I have previously alluded to the phenomena by which aircraft employed by the most dominant air carriers during the past two or three decades have reconfigured aerial-spatial relationships among city-regions, not only in the United States but in the rest of the aerial-enabled world. These aircraft have enabled international carriers to leapfrog traditional gateway city-regions — such as Los Angeles — potentially, disrupting, or upending altogether, the place of Los Angeles within the national air traffic system.

Two recently-commissioned commercial passenger aircraft, the Airbus A380 and the Boeing 787, exemplify this reconfigurative process, and carry a real potential to disrupt the aerial place and position of Los Angeles within domestic air traffic networks. Both aircraft make use of lightweight composite materials, adaptive flight controls, drag-reducing winglets, more efficient engines, and other aeronautical innovations designed for more efficiently producing aerial space (Wallace, 2006). The fuselages of each aircraft, for example, are constructed using techniques and technologies to a degree never before applied on commercial passenger aircraft. The fuselages of most conventional airliners are still primarily constructed from sheets or panels of aluminum alloy somehow fastened together (e.g., by rivets; Walz, 2006). The 787 is the first
commercial airliner to use a composite fuselage, formed from a single barrel of carbon-fiber composite, making it lighter and stiffer than conventional aluminum-alloy techniques and materials. The A380 fuselage is similarly the first to be constructed using a composite material known as GLARE (or, GLAss REinforced aluminum), in which a dense, lightweight material is formed by sandwiching sheets of aluminum foils and glass fibers (Fokker, 2013). The 787 in its entirety is about 50-percent composite by weight; the A380; about 20-percent. The weight savings are considerable in either case.

The relative lightness of these aircraft and other aerodynamic innovations represent their respective manufacturers' response to the volatile price of jet fuel. Based on available data, it is difficult to determine the actual fuel savings offered by each aircraft. Airbus and Boeing both begin their fuel-consumed-per-passenger calculations from assumed seating configurations which 1) benefit the respective manufacturers, and 2) might not match the configurations preferred by airlines in practical usage. We can therefore draw more accurate impressions of fuel savings from the operators themselves. On that count, Lufthansa and Emirates both conclude that the A380 burns less fuel per passenger than its nearest competitor, the Boeing 747-8 (Rothman and Rothwell, 2010; Leeham News and Comment, 2010). Similarly, the Boeing 787 launch airline, All Nippon Airways (ANA), has reported better than expected fuel savings on long-range flights — in-line with claims by Boeing that the 787 consumes 20-percent less fuel than airliners of comparable size, including the slightly-smaller Boeing 767 (Norris, 2012; Boeing, 2013).

Boeing's extensive use of composites within the 787 breaks sharply from that of its previous design, the 777 (introduced in 1995), which is only 9-percent composite materials by weight. Airbus is following Boeing's lead with its A350, a carbon-composite fuselage design entering service in 2014 as a direct competitor to the 787 (Jansen, 2013).

The designs of the 787 and A380 express different aspects of the dominant strategies employed by air carriers in the deregulated era — and particularly in the more recent era of volatile fuel prices. In general terms, commercial passenger carriers stand to lose profit when
moving anything through the air that has not paid a fare. Anything that adds to the weight of the aircraft diminishes, however slightly, a carrier's profit margin. This includes items such as stowed or checked luggage, meal carts, the cabin crew, and fuel. Even peanuts. But the heaviest and most expensive piece of equipment transported by the aircraft remains the aircraft itself. The increasing proportion of carriers' operations costs devoted to fuel has put pressure on carriers and aircraft manufacturers to simultaneously carry more passengers and less plane.

The overriding objective for privately-held air carriers, then, is to maximize revenue (gained primarily through ticket fares) while eliminating drags on profit (e.g., fuel costs, airport slots, empty seats, crew pay and pensions, the weight of the aircraft and its contents). Under these conditions, the 787 and A380 offer radical improvements over previous aircraft designs, many of which are still in use. While some of the drags on profit are largely unrelated to aircraft design (pension payments, for example), other drags can be effectively addressed by carriers who use the most appropriate aircraft along each route. One way carriers might accomplish this is by reducing flight frequency and airport slots on busy routes while maintaining or expanding capacity. Airbus has designed the A380 to this end; its seating capacity enables carriers to offer less frequent service while maintaining, and in some cases actually expanding, capacity along their busiest routes. This carries the added benefit of reducing congestion at the busiest airports in the world: JFK, Heathrow, Hong Kong, Dubai, and other megahubs — the handful of airports serving the large markets, and precisely the type of airport for which Airbus tailored the A380's range and seating capacity (Flottau, 2012).

A second technique for reducing drags on profit is for carriers to reduce their fuel costs, also while maintaining or expanding passenger capacity. To help carriers achieve this objective, Boeing intends for the 787 to “bring the economics of large jet transports to the middle of the market” — primarily by designing it to burn less fuel than competing aircraft of similar size, including the Airbus A330 and A340 (Boeing website, accessed 2013). Its lightweight fuselage and drag-reducing technologies enable airlines to offer less frequent, nonstop international
service to smaller markets, which might not fill the larger aircraft usually employed on those routes — a 787 has roughly half the seating capacity of an A380, for example. This is the model adopted by All Nippon Airways (ANA), the first carrier to receive the aircraft from Boeing. ANA plans to integrate their 787 fleet within their international networks, where the aircraft's range will enable ANA to connect Tokyo with “middle of the market” cities such as Denver or Boston, and the aircraft's relatively lower seating capacity (relative to the A380 or 747) will enable ANA not only to offer service along these routes in the first place, but to generate profits while doing so (Honig, 2011). For the time being, however, Los Angeles is the only US airport to be served by 787s operated by two carriers. In early January 2013 — prior to the mass grounding — the Chile-based LAN Airlines began LAX service three times per week using the 787. The following day, United Airlines began operating the 787 on its LAX-Tokyo route (Molnar, 2013).

Some other, less pronounced contemporary trends will doubtless continue to reconfigure the aerial-spatial position of the Los Angeles within passenger air networks at all scales, including that of the domestic, or continental scale. One of these trends may have more intra-urban than inter-urban effects. Low-cost carriers (LCCs) are gradually consolidating their

35 These plans were put on hold in early 2013, after electrical system malfunctions occurred on several aircraft in early 2013. One of these incidents happened aboard an All Nippon Airways 787, forcing the crew to make an emergency landing when the aircraft's lithium-ion backup battery overheated and began to fill the electrical compartment with smoke (BBC News, 2013). The ANA incident led to the FAA grounding all American-owned 787s indefinitely, until Boeing discovered the cause and developed a solution to the battery malfunctions. Carriers and transportation ministries in other countries followed suit (Topham and Scott, 2013). Boeing and FAA regulators conducted a series of tests designed to ensure the safety of a redesigned battery system. United — the only US based 787 operator, with 6 of the aircraft — announced in April 2013 that it would begin using its 787 fleet on a Denver-Houston route in late-May and a Denver-Tokyo route, beginning early-June 2013 (Reuters, 2013). Soon after this, the FAA and similar regulatory bodies in other countries approved Boeing's solution to the battery fires and lifted the grounding order.
operations at primary airports within city-regions, in a shift away from the secondary airports once integral to the LCC business model (Snyder, 2011). While European business media have given the issue considerable attention, it has largely escaped the notice (or interest) of North American media outlets and city-regional researchers. In Europe, Dublin-based Ryanair and its closest competitor, London-Based easyJet, are in the process of shifting hub operations from secondary airports in city-regional peripheries to many of the busiest, centrally-located airports on the continent (Rothwell, 2010). There are several reasons for this shift:

1. The growth of the carriers has slowed in part because they have reached capacity and thus no longer need to offer deeply-discounted fares. These carriers can therefore afford to engage in a 'no-frills' business model while competing with legacy carriers in other dimensions of the airline business. For instance, on convenience: LCCs are beginning to offer service at airports with improved access to a greater number of passengers over peripheral facilities.

2. Unbundled airport services allow LCCs to pay only for those facilities and services their business model requires. Carriers can avoid or scale-back on certain airports services, such as check-in counters and baggage-handling facilities, by passing these onto those passengers willing to serve themselves or pay additional fees. Examples of this include unmanned check-in kiosks, online check-in services (and apps), and baggage fees attached to checked luggage and carry-ons. Unbundled airport services allow LCCs to use more expensive airports while maintaining lower base fares than their legacy competition.

3. Finally, the well-established legacy carriers have similarly experienced slowed growth during the past decade. The business of airports suffers as a result, such that airports — even the costly facilities with convenient access to large city-regional populations — must offer lower rates in order to attract and expand passenger airline operations, regardless of carrier type.

In the Los Angeles region, this shift is only recently underway. From 2010-2011, Cheyenne-based Great Lakes Airlines shifted all its Los Angeles operations from LA/Ontario to LAX. In 2011, JetBlue shifted its daily Los Angeles-Fort Lauderdale service from Long Beach Airport to LAX (JetBlue, 2011). Southwest Airlines has also recently cut flights at LA/Ontario (Márquez, 2011). The airline has made LAX its focus of operations for the region. In early 2013, LAX announced $400-million in upgrades to Terminal 1 and sole occupancy of all 15 of its gates to
Southwest Airlines (Sumers, 2013). When San Francisco-based low-cost carrier Virgin America began operations in 2007, it focused its Los Angeles operations at LAX. Thus, even as LAX continues to pivot towards transpacific air traffic (as we shall see in the next section), its role within domestic air traffic networks — particularly its relationship to similarly-sized airports in the United States — has become increasingly subject to innovations in aircraft technology and network strategies, which are themselves largely a response by aircraft manufacturers and airlines to the volatile price of jet fuel, and especially the increasing proportion of operating costs airlines must devote to fuel.

**Los Angeles within Global Aerial Networks**

The distribution of passengers across distances allows us to see the shape of the aerial-produced footprint for the Los Angeles region — particularly LAX — in comparison with some other domestic facilities. In the section that follows, I will analyze and discuss in greater detail the change in the relational configuration of Los Angeles within global air traffic networks. I begin by discussing LAX air passenger flows with regard to the city-region's relationships with distant global regions. Next, I examine how the space of aerial linkages for Los Angeles is produced and configured by internationally-based airlines.

**Latin America and the Caribbean**

The importance of Central America to Los Angeles passenger air traffic has diminished since 1990, when it comprised a full third of all international air traffic between Los Angeles and city-regions outside the United States. Despite slipping slightly in its centrality, however, the region still receives over a quarter of all international air passengers involving Los Angeles, and remains the single most important region within Los Angeles air traffic networks.

The distribution of passenger traffic from airports in the United States to countries such as El Salvador, for example, has flattened somewhat. In 1990 the top three US airports (Miami,
LAX, and Houston) serving El Salvador accounted for 94-percent of all direct passenger flows to the country from the United States; in 2011 the top three airports (LAX, Houston, and Dulles) accounted for just over 50-percent of such flows. Despite the general flattening, however, LAX in particular has solidified its position as the primary US airport serving El Salvador. Passenger volumes involving Mexico tell a similar story. Where in 1990 Los Angeles International Airport was the primary gateway to Mexican airports (with Dallas' and Houston's airports a distant second and third), the distribution of passengers from airports in the United States to Mexico had flattened considerably by 2011, with the top three airports (Houston, LAX, and Dallas) each serving between 10–16-percent of Mexico-bound passengers.

Peru is an exception among South American countries with strong historical ties to Los Angeles, in that LAX has actually gained share among United States airports (though it has not gained in rank; it is still second to Miami). As with many of the largest Central and South American airports, Peru's major airport, Jorge Chavez International Airport (LIM) in Lima, was served by a larger and more geographically-diverse set of US airports in 2011 than in 1990. Among the set of nine Central and South American countries heavily served by LAX in 1990, Miami served as the primary gateway for over half of US international air traffic to seven of these (Argentina, Brazil, Colombia, Costa Rica, Ecuador, Guatemala, and Peru). Among this list, Miami retained a simple majority of US flows only to Ecuador. Involvement by other US airports — most notably Atlanta's and Houston's — has risen relative to LAX, MIA, and to a lesser extent, Dulles and JFK. Furthermore, while Miami is still largely oriented towards Central and South America — more so than any other North American airport, and perhaps any single airport in the hemisphere — Los Angeles has shifted its air traffic focus across the Pacific Rim, to Asia and Australasia.
Asia & the Middle East

Flights across the Pacific to Asian city-regions comprised 29.4-percent of international air traffic involving LAX in 1990 and 32-percent in 2011. As with many Central and South American city-regions, US air traffic to Asian city-regions has gone through a process of deconcentration over the past two decades, in which new airline strategies and new aviation technologies have enlisted a wider range of US airports in international air traffic provision.

Of the ten Asian and Middle-Eastern countries having significant air traffic relationships with LAX (see Figure 17), eight have undergone deconcentrated connections with US airports, with the top three airports serving each offering a diminished cumulative share of total United States international passenger air traffic in 2011 compared with 1990. The only one not to do so at all, the United Arab Emirates, had no scheduled passenger connections with the United States until the late-1990s. Additionally, passenger traffic among the top three US airports serving Taiwan remained relatively stable between 1990 to 2011 (going from 85- to 84-percent). I have listed all of the countries below, followed by the cumulative percentage among the top three airports as a percentage of total United States international passenger traffic flows for each of the two years:

<table>
<thead>
<tr>
<th>Country</th>
<th>1990</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>99%</td>
<td>58%</td>
</tr>
<tr>
<td>Singapore</td>
<td>94</td>
<td>64</td>
</tr>
<tr>
<td>South Korea</td>
<td>71</td>
<td>48</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>94</td>
<td>76</td>
</tr>
<tr>
<td>Russia (USSR)</td>
<td>99</td>
<td>84</td>
</tr>
<tr>
<td>Turkey*</td>
<td>100</td>
<td>86</td>
</tr>
<tr>
<td>Philippines</td>
<td>76</td>
<td>67</td>
</tr>
<tr>
<td>Japan</td>
<td>63</td>
<td>56</td>
</tr>
<tr>
<td>Taiwan</td>
<td>85</td>
<td>84</td>
</tr>
<tr>
<td>UAE</td>
<td>NA</td>
<td>61</td>
</tr>
</tbody>
</table>

* Only two US airports offered service to Turkey in 1990.

**Figure 17**  Cumulative share for top three US airports serving each country, as a percentage of total US-international passenger volumes, 1990 & 2011
Despite the nearly universal deconcentration among these countries' connections with the United States, LAX improved upon, maintained, or assumed a top-three ranking in all cases, solidifying its role as West Coast gateway (Figure 18, next page).
<table>
<thead>
<tr>
<th>Country</th>
<th>Change in rank from 1990-2011</th>
<th>1990 ranks</th>
<th>2011 ranks</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>+2</td>
<td>SFO 52</td>
<td>LAX 22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JFK 25</td>
<td>ORD 18</td>
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<td></td>
<td></td>
<td>LAX 22</td>
<td>SFO 18</td>
</tr>
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<td>Hong Kong</td>
<td>+1</td>
<td>SFO 60</td>
<td>SFO 34</td>
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<td></td>
<td></td>
<td>SEA 26</td>
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</tr>
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<td></td>
<td></td>
<td>LAX 8</td>
<td>JFK 20</td>
</tr>
<tr>
<td>Taiwan</td>
<td>0</td>
<td>LAX 47</td>
<td>LAX 48</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SFO 28</td>
<td>SFO 28</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JFK 10</td>
<td>SEA 8</td>
</tr>
<tr>
<td>South Korea</td>
<td>0</td>
<td>LAX 33</td>
<td>LAX 22</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HNL 21</td>
<td>SFO 13</td>
</tr>
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<td></td>
<td></td>
<td>JFK 17</td>
<td>JFK 13</td>
</tr>
<tr>
<td>Philippines</td>
<td>0</td>
<td>LAX 32</td>
<td>LAX 28</td>
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<td>SFO 30</td>
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<td>GUM 14</td>
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<td>Japan</td>
<td>0</td>
<td>HNL 34</td>
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Source: Bureau of Transportation Statistics T-100 Market Data and author's calculations.

Note: Destination countries listed are those 1) for which LAX ranked in the top three in either year among United States airports, and 2) which received at least 250K passengers from LAX in 2011 or its indexed equivalent in 1990 passengers (172K).

Figure 18  Top Asian/Middle-Eastern countries for direct air traffic relationships with LAX
LAX gained ranking positions among United States airports connections in two cases (climbing two positions for China and one for Hong Kong), lost position in another case (Singapore), maintained its previous ranking in four cases (Taiwan, South Korea, Philippines, and Japan), and vaulted from providing no service to becoming a top-three airport for the remaining three cases (UAE, Turkey, and Russia).

In 2008, Emirates began direct flights from LAX to its major hub in Dubai, UAE. This inaugurated the first scheduled passenger service between any West Coast airport and the Persian Gulf (Pae, 2008). This route — an 8,000 mile, transpolar flight — became practical only after the Boeing 777-200LR Worldliner entered service in 2006. To support this service, Emirates devotes a handful of aircraft among its fleet of ten Worldliners — the largest 777-200LR fleet of any airline. The 777-200LR can link virtually any two cities in the world by employing technologies and designs that make long range travel more fuel efficient and comfortable, including auxiliary fuel tanks, extended wingtips, a strengthened frame, increased engine-thrust capacity, and a crew rest area (Flug Revue, 2006).

In addition to Emirates, several other Asian-based airlines began service to LAX between 1990 and 2011, as Asia surpassed Europe to become the region with the most headquartered airlines operating out of LAX (see Figure 19, following page). The number of Asian carriers at LAX more than doubled, from 8 in 1990 to 17 in 2011. In addition to Emirates, this increase includes several airlines from East and South East Asia, most notably from China, whose state-owned China Southern, China Eastern, and Air China have all increased or added capacity to LAX over the past two decades.
Figure 19  Count of international carriers serving LAX, by headquarters region

Australasia

LAX has pivoted away from linkages with Europe and Latin America in favor of transpacific linkages with not only Asia but, increasingly, Australasia (including Australia, New Zealand, and various South Pacific islands, such as Fiji, Samoa, and Tahiti). Over the past two decades, the share of flights relating Los Angeles within Australasian air traffic networks has doubled from 9.2- to 18.4-percent, made possible by more efficient planes, and practical by the escalating price of jet fuel. Air traffic between Australia and the United States, in particular, has broadened considerably after the two nations agreed to an “open skies” agreement in October 2008 (Associated Press, 2008). The route had previously been protected for one airport from
each country: Qantas from Australia and United from the United States. The agreement opened the route to competition among airlines headquartered in either country, expanded the number of authorized destinations in each country, and removed limitations on flight frequency, seating capacity, and pricing (Governments of the United States of America and Australia, 2008). This agreement enabled, for instance, Virgin Australia not only to begin LAX service in 2009 but to become the airport's tenth largest internationally-based carrier by 2011, ranking just behind Aeromexico and Lufthansa (see Figure 20).

![Figure 20](image)

Figure 20  Top ten internationally-based airlines serving LAX

The agreement has driven not only competition within Australia-to-West Coast routes but also necessitated new aerospatial technologies. Delta has requested Boeing extend the range on its
777-200LR *Worldliner* so that the airline can introduce routes between the East Coast of the United States and Australia (Field, 2008).

Unlike the marked deconcentration of Asian and Latin American air traffic involving the United States, the cumulative share of the top three US airports serving Australia and New Zealand (in both cases, LAX, SFO, and Honolulu) has flattened only slightly in the case of Australia (in 1990, 94%; in 2011, 89%) and not at all in the case of New Zealand (in 1990, 97%; in 2011, 99%). Moreover, the share of passenger air traffic to the United States involving each of these countries has become heavily concentrated at LAX. Whereas Honolulu once served as the major gateway for air travel between Australasia and the North American or United States markets, this role has shifted to Los Angeles, which now serves 66% of all Australian and 68% of all New Zealand passenger air traffic.

**Europe**

European airports (particularly those in Northern and Western Europe) have slipped only slightly in their direct flight relations with Los Angeles. Whereas Northern and Western Europe constituted a combined 23.2-percent of Los Angeles international air traffic in 1990, by 2011 that had dropped slightly, to 19.6-percent. Much of the decline may be attributed to the loss of the historic Scandinavian Airlines (SAS) route between LAX and Copenhagen, which accounted for 18-percent of all United States-to-Denmark air traffic in 1990. As I stated above, the route began in 1954 as the first scheduled trans-polar route in the world; SAS closed the route in 1994 after it had become unprofitable. LAX also lost direct air traffic relationships with the Netherlands, falling from the second most important US airport in Dutch international air traffic networks to the twelfth. Los Angeles made no substantial air traffic connections with any European country from 1990 to 2011. In most cases, the Los Angeles city-region lost direct connections with Europe to airports in the Eastern United States, either emergent (e.g., Newark Liberty and Orlando) or established (e.g., JFK and Atlanta), as well as to a handful of West Coast airports,
such as Las Vegas, that have improved and expanded facilities over the past two decades. Airlines have eliminated all but the most profitable long-haul routes between Europe and the West Coast of the United States, preferring instead to use one of the East Coast gateway airports (primarily JFK, Newark Liberty, or Dulles).

As with Latin America and the Caribbean, however, much of the slight decline in European traffic as a proportion of total LAX international passenger traffic can be attributed to the increasing integration of the airport within the networks of transpacific carriers such as Qantas, Cathay Pacific, and Virgin Australia (see the earlier Figure 20). Korean Air and China Airlines began flying to LAX in the early-1970s (Flight International, 2007); both have solidified these long-established, consistently-profitable operations. Other carriers, such as Dubai-based Emirates, have recently established operations at the airport. The decline of direct flights by European-based carriers to LAX, therefore, has been neatly displaced by a corresponding rise in transpacific connections linking LAX to Asia and Australasia via a number of international carriers.

**Conclusion**

The Los Angeles city-regional airport system performs a number of functions within several nesting, overlapping passenger air traffic networks. The city-region serves as a hub within western air travel networks oriented primarily along a north-south axis. Because it sits on the edge of the North America, however, LAX and the other airports in the region do not serve as hubs in the sense of centrally-located airports. Chicago's O'Hare International Airport, for example, sits nearly at the midpoint between Northeast Corridor airports (e.g., JFK, PHL, BOS) and those in the Central and Mountain Times Zones (e.g, Denver and Dallas). Atlanta's Hartsfield-Jackson International, the largest hub facility in the world, is nearly equidistant from several large airports, including Miami, Denver, and O'Hare. Los Angeles International is the 14th “most important hub in absolute terms” — a measure of the absolute number of passengers
who use the airport to make a connecting flight — but when dividing the number of hub passengers by all passengers who use the airport, LAX falls from the top-25 list entirely (Derudder et al., 2007). It is a center for direct travel involving nearby cities with strong economic or cultural ties to Los Angeles, including San Francisco and Las Vegas.

Most critically, however, is the role Los Angeles plays within origin-destination flows, where it serves as the primary West Coast gateway for the United States. It is a city-regional role whose performance relies almost entirely upon LAX. When examining only origin-destination flows, for instance, Los Angeles was found to be the second most important city in the United States for international connectivity in 2002 (Smith and Timberlake, 2002), the third in 2005 (Taylor and Lang, 2005), and the third again in 2007 (Derudder et al.). In each of these studies, LAX is the only airport in the region to specialize in international passenger traffic. As with other internationally-oriented origin-destination facilities (i.e., JFK, Miami, Dulles, and Newark Liberty), LAX has sustained this specialization throughout the past two decades, using international air traffic revenues to counterbalance the sometimes volatile domestic market: a weaker US-dollar often attracts international tourists (Pae, 2008). The position of LAX within global air travel networks has shifted slightly in the two decades since 1990: from one of intense air traffic relations with city-regions in Latin America — especially Mexico and Central America — to one of intensified transpacific air traffic relations with Asia and Australasia.

It is clear from other research that the pivot by LAX from transamerican to transpacific linkages, particularly involving Asian city-regions, is due less to the ascendancy of Los Angeles within the global economy and more to the increased connectivity among Asian city-regions generally. Los Angeles, for instance, was the biggest loser in Derudder et al.'s analysis (2010) of the shifts in connectivity among the 132 cities in the network model devised by the Globalization and World Cities research network (GaWC). The model measures global connectivity not according to air linkages but according to a more conventional Global City research approach, which focuses on cities' participation within the distributed office networks of a set of
multinational firms providing advanced producer services (APS). These firms provide specialized services to manufacturing and service industry firms, including financial, insurance, accountancy, advertising, law, and consultancy services. Cities are ranked according to their global network connectivity score (GNC), which the authors express as a proportion of the most connected cities within the global cities dataset (i.e., London in 2000, and New York in 2008).\textsuperscript{36} Los Angeles had a rank of 10 according to the 2000 model and fell 30 places to position 40 in 2008 — a larger decline than any other city within the model.\textsuperscript{37} Tellingly, the biggest gainers in the 2008 model were Beijing (from 29 in 2000 to 10 in 2008), Shanghai (27 to 8), and Seoul (30 to 14). In addition to Los Angeles, many other North American and European cities experienced declining connectivity between the two models. The authors label this trend an ‘east–west swap.’

In spite of its decline in APS linkages, Los Angeles continues to serve as the primary West Coast gateway for international air traffic linkages. While its direct air traffic relationships with Latin America has eroded absolutely — and often dramatically, as in the case of major partners El Salvador, Guatemala, and Mexico (see Figure 21, next page) — relative to other US airports, LAX still maintains strong ties with many Latin American city-regions, especially in

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\textsuperscript{36} Rather than look at absolute numbers of firms, Derudder et al. (and most other global cities research) focuses on shifts within urban relationships rather than changes among the absolute numbers of APS firms and linkages. This is due primarily to the dynamism of the APS sector: it is difficult or impossible to measure the changes to the absolute number of APS firms when many of these may split, merge, or dissolve during the period from one dataset to another (Derudder et al., 2010). Global cities researchers, therefore, prefer to measure temporal changes within a given city's global connections by isolating those which prove \textit{directly} and unambiguously related to the broader network value and position of the city itself, rather than those \textit{indirect} changes which may attend, for instance, particular “firms’ overarching corporate strategy of global expansion/retraction (in this city and in all other cities)” (Orozco et al., 2010; 1954).

\textsuperscript{37} In 2000, Los Angeles had a GNC of 58.75 (compared to London's 100.00); in 2008, the GNC of Los Angeles had fallen to 45.18 (compared to New York's 100.00). By way of contrast, Shanghai (ranked 27 in 2000, and 8 in 2008) climbed from a GNC of 43.95 (in 2000) to 69.06 (in 2008).
Central America. For example, LAX lost a significant share of passenger flows between El Salvador and the United States (LAX handled 32-percent of these passenger volumes in 1990 compared with 22-percent in 2011) yet also overtook Miami to become the primary US-El Salvador gateway.
This situation — in which a diminished share of air traffic flows in the absolute sense exists alongside strengthened air traffic relationships in the relative sense — is largely a result of airline strategies for increasing profit margins during a period of escalating fuel costs. These strategies
have given rise to deconcentrated air travel networks, in which airlines' route structures integrate a wider range of US airports within Latin American passenger networks. With regard to former and current LAX partner city-regions in Latin America, the chief beneficiaries of deconcentration have been the George Bush Intercontinental Airport, in Houston, and to lesser extents the international airports in Atlanta and Dallas. Though more research is needed, especially into the extent to which this particular shift — airlines' increasing focusing on markets in the Midwest and Eastern United States at the expense of LAX — correlates with LAX and Los Angeles city-regional capacity issues (as opposed to, say, broader US demographic trends). Despite the reasons for it, international air travel involving Los Angeles presents us with clear patterns of reconfiguration: LAX air passenger volume continues to increase as the airport shifts direct flight connectivity towards growing transpacific markets, and away from those in Europe and Latin America. For over three decades, institutional actors at all scales of governance within the Los Angeles city-region have at one time or another planned for redistributing the gradually increasing passenger volumes throughout the other airports within the regional system — a set of strategies commonly referred to by air traffic planners as regionalization. The protracted regionwide deliberations over how — or, more importantly, where — to regionalize LAX air traffic has given rise to a sort of spatiopolitical accounting: foregrounding the relationship between the terrestrial and aerial spaces of the city-region, and offering planners and the public an opportunity to consider the spatial and social (re)organization of city-regional aeriality.

In the next chapter, I will explore this spatiopolitical accounting as it implicates the use or reuse of other airports in the Los Angeles city-regional system, particularly Marine Corps Air Station El Toro. Chapter Four and Five comprise a two-part consideration of the reuse controversy that followed in the wake of El Toro's closure announcement. The ensuing political struggle highlights not only the region's developing air traffic capacity crisis, but also the multidimensional relationship situating an airport within broader, political-economic and physical-ecological systems.
Chapter 4

THE EL TORO REUSE STRUGGLE

Water, water, every where,
And all the boards did shrink;
Water, water, every where,
Nor any drop to drink.

— Samuel Taylor Coleridge, *The Rime of the Ancient Mariner* (1798)

There is an art, it says, or rather, a knack to flying. The knack lies in learning how to throw yourself at the ground and miss. … Clearly, it is this second part, the missing, which presents the difficulties.


Introduction

*The Core* is a 2003 science fiction film in the vein of disaster films *Independence Day* (1996), *Armageddon*, and *Deep Impact* (both from 1998). Whereas those three previous films premised the potential destruction of civilization upon extraterrestrial events (earth versus aliens, earth versus asteroid, and earth versus comet, respectively), the crisis in *The Core* is subterranean: the earth's outer-core has stopped rotating, which will lead to the breakdown of the planet's electromagnetic field and a loss of protection from solar microwave radiation. Birds can no longer navigate. Pacemakers fail. Rome is destroyed by a superstorm. A rogue sunray melts the Golden Gate Bridge. The film is infamous among physical and earth scientists for its butchery of basic science. A meeting of scientists at the NASA Jet Propulsion Laboratory in 2011 selected the film as the second worst science-fiction film of all time (Harlow, 2011). At the
2011 annual meeting of the American Association for the Advancement of Science, physicist Sidney Perkowitz named *The Core* the worst cinematic depiction of science out of the more than 120 he researched for a book on the subject (National Academy of Sciences, 2010).

But it did get one thing right, however inadvertently. The film opens with the Space Shuttle Endeavour having just completed a mission to outer-space. The crew initiates re-entry procedures: gas jets in the nose redirect the craft towards Earth, crew-members strap themselves into their seats, and the pilot contacts Mission Control before allowing gravity to pull the craft home. Immediately upon the shuttle's atmospheric re-entry, Mission Control's tracking monitor in Houston presents the flight status on a green background:

**MISSION PLAN**

**LANDING THRRESHOLD:**

Edwards Air Force Base

Everything seems normal. The shuttle descends like an airliner now, preparing to land. Until the final years of the program most space shuttle missions departed from Florida but ended at Edwards Air Force Base, about 75 miles north of Los Angeles. This first status update, however, is urgently superseded by another, this one on a red background:

**FAIL SCENARIO**

**LANDING THRRESHOLD:**

Los Angeles Area

Something is wrong. Alarms sound. Lights blink. The flight director slowly rises to her feet, eyes fixed on the situation as it plays-out on the central tracking monitor. She informs the pilot his shuttle is off course by 129 miles — as it turns out, faulty aeronautic guidance systems are one consequence of a core that stops rotating. But we do not know this yet. Nobody does. Besides, nobody has time to ask *why* the shuttle is off by so much; there is only time to ask *where* in the “Los Angeles area” might the shuttle safely touchdown without killing everybody aboard or —
worse — Los Angelenos going about their daily routines. Thus begins the mad search for a usable alternative to Edwards Air Force Base. (It is rush hour so the freeways are off-limits.)

After some hasty calculations, the co-pilot turns to the pilot and asks, “Bob, do you know LA? Because I have an idea.”

She asks Mission Control if the shuttle is clear to use the Los Angeles River as a landing site.

An analyst responds in a halting stammer, “It's theoretically possible.”

The shuttle pilot adjusts course. As the craft hurtles toward the river's dry concrete culvert and the several bridges spanning it, the pilot issues a warning to his crew (and to us): “Hang on! This isn't going to be subtle.” (And it isn't. None of it is.) After threading the craft through one tight squeeze after another and executing a series of delicate maneuvers (and one semi-controlled spin), he brings the shuttle to an improbable halt, having caused neither significant injury nor damage to anyone or anything. A welder on one of the bridges is oblivious to the commotion of the landing as it unfolds behind him, but he is mercifully (and comically) spared as the shuttle comes to rest mere feet behind him. He slowly wheels around to face it, nose to nose with the massive spacecraft.

*The Core* wears its B-film credentials on its sleeve. Yet we can still wring some deeper insights from the Los Angeles River landing. One of these is its illustration of the “Los Angeles Area” as a “Landing Threshold” fraught with blinking red lights and no good place to (crash)-land an aircraft, perhaps especially on such short notice. At no point in the sequence does anybody suggest using one of the region's dozens of airports or airstrips — some dormant, others little used. The film's creators may well have already dismissed that as implausible, having already carefully researched and considered no other aspect of the physical world save the air traffic capacity issues that have plagued the Los Angeles city-region for at least the past two decades. “Given air traffic congestion in the region and its strong tradition of NIMBY-ism, there
is no way anybody in this scene would ever suggest landing the shuttle at a facility designed to receive aircraft,” the screenwriter might have argued in this scenario.

More likely (and less sarcastically), it was a benign oversight in service to dramatic tension. The filmmakers likely did not realize the “Los Angeles Area” is brimming with “Landing Thresholds”: facilities designed (more so than the Los Angeles River, anyway) for gathering aircraft from its skies (as indicated in Figure 2 in Chapter One). Or perhaps they did know this but decided not to mention this fact to heighten the suspense, giving us a spectacularly unsubtle shuttle landing.

Whatever the reason, The Core boils-down a central conflict of Los Angeles city-regional governance into seven minutes of computer-generated theatrics. That conflict, expressed in mere words, goes something like this: in order to safely and efficiently handle the increasing numbers of air passengers, especially those gathered by the rapidly-aerosolizing city-regional economies of the Pacific Rim, the Los Angeles region must 1) expand capacity at LAX through additional facilities and extensive reconfiguration of its runways, 2) regionalize air traffic so that airports in the regional core — either extant (i.e., BUR, SNA, LGB, ONT) or unrealized (e.g., El Toro) — create regional capacity enough to free LAX for handling more specialized routes and aircraft, 3) renovate and enlist peripheral facilities — for example, the Southern California Logistics Airport, Palmdale Airport, and March Joint Air Reserve Base — to share in regional air traffic for similar purposes. Otherwise, the passengers and airlines who desire mere access to the domestic air traffic network of the United States, or North America's continental network, will bypass LAX altogether, as more efficient aircraft allow a broader spectrum of airports, both coastal (e.g., San Francisco) and inland (e.g., Denver), to continue their development into major international gateways on par with JFK and LAX.

In researching the struggle over El Toro's reuse, I uncovered a number of strategies that actors at various scales employed to influence how and where the Los Angeles city-region could/should/would produce and enable aerial space within a coherent regional airport system.
At the regional scale, these emerged as a set of policies, alliances, and planning practices designed to *regionalize* air traffic throughout the airport system, primarily for the purposes of relieving LAX and its neighboring communities from shouldering the considerable environmental costs associated with serving as the region's primary airport, Southern California's only significant international airport, and the busiest international gateway facility on the West Coast. Planners and policymakers who have advocated regionalization strategies often frame the issues as one of equity, by which communities who consume city-regional aerial space must also contribute in roughly equal measures to its production.

The remainder of the chapter is organized into three primary sections. In the first, I provide an overview of regionalization as a set of policies for coping with intensifying air traffic, with a more detailed discussion of the largely successful implementation of regionalization policies for the airport system centered on Boston's Logan International Airport. The second provides the geography and background of Los Angeles city-regional airport system, with a particular focus on decommissioned or converted military airfields, including El Toro. In the third and final section, I sketch the broad political-economic interests of the regional stakeholders for this Los Angeles city-regional system (and whose mobilization during the El Toro struggle I address in the next chapter).

**Regionalization**

**A Brief History**

Aircraft manufacturers introduced jet passenger aircraft during the 1950s\(^{38}\), though it was not until the 1960s that jets began to comprise the bulk of air carrier fleets. The engines of these new aircraft allowed the air carrier industry to improve access within air travel networks for

\(^{38}\) The United Kingdom-manufactured de Havilland Comet first took flight in 1949 but entered commercial service in 1952, with the British Overseas Airways Corporation, or BOAC.
those able to afford tickets. Jet airliners could carry more passengers over longer distances at higher speeds than turboprop alternatives. Federal deregulation of the US airline industry in the late-1970s further improved access to air travel networks, as ticket prices became affordable to a larger pool of potential passengers. These two changes within the industry led to subsequent increases in air passenger volumes throughout the 1980s, which quickly exhausted the capacities of existing airport infrastructure. But the intensification of air traffic volumes encountered another set of constraints. Specifically, the environmental impact of airports on their city-regional surround and the financial condition of airport operators themselves limited the ability of local and regional governments either to expand existing facilities or to construct new ones. When Denver International Airport opened in 1995, for instance, it became the first major commercial airport in the United States built from the ground up since Dallas/Fort Worth International Airport (which opened for service more than two decades prior, in early 1974). In the United States, the airline industry's continued reliance on facilities predating both the jet age and federal deregulation contributed to systemwide delays. The national air traffic system had become constrained by runways unable to handle larger aircraft, and terminals unable to process larger passenger volumes.

The FAA responded to the brave new world of jet airliners by introducing, among other measures, its Airport Capacity Design Teams, which featured FAA representatives working with officials at those airports especially affected by delays. These teams helped identify and recommend to the federal government potential improvements at these airport which might minimize delays or eliminate them altogether. Beginning in the early-1990s, the FAA extended this model with its Regional Capacity Design Team studies, which analyzed the major airports in particular city-regional systems as if they were a functionally-cohesive infrastructural system, and offered recommendations to local governments on how best to integrate their airports within the national airspace system. Whereas the Airport Capacity Design Team studies often recommended the construction of new runways or the expansions of current ones, the

The federal government (also via the FAA) further promotes regionalization strategies through grant funds it makes available to local planning organizations engaging in regional aviation planning.39 Between 1999 and 2008, the FAA dispersed over $34 million primarily to federally-mandated municipal planning organizations (MPOs) responsible for creating and updating regional airport systems plans (RASPs) and related studies (GAO, 2009; 63). The Los Angeles city-region alone received over $8 million during that span — more than double the FAA funds received by the New York city-region. Unlike many large metropolitan regions, the bulk of aviation planning for the New York city-region is not conducted by its MPO (the New York Metropolitan Transportation Commission) but instead by the Port Authority of New York and New Jersey (PANYNJ) and the Regional Plan Association, a nonprofit planning organization. This planning situation trades on the multimodal breadth of Port Authority transportation assets. In addition to operating seven marine cargo terminals for the Port of New York and New Jersey, all major Hudson River bridge and tunnel crossings, the PATH rail system, and the Port Authority Bus Terminal, the PANYNJ also operates five of the largest airports in the region, including John F. Kennedy International (JFK), LaGuardia (LGA), Newark Liberty International (EWR), Teterboro (TEB) Airports, and the recently-acquired Stewart International (SWF).40

39 A 2009 GAO-sponsored survey of the 381 MPOs found only 20-percent of the 324 respondent MPOs had a state-authorized responsibility for regional aviation planning. The same survey found that, of the 42 MPOs serving a metropolitan population of 1 million people or more, 41-percent (17 total) conducted aviation planning within the region.

40 Stewart International Airport has had an interesting ownership history. In 2000, a privately-held, UK-based transportation operator began a 99-year lease from a New York State-chartered development corporation. In 1997, the PANYNJ bought out the remained of the lease from the
Though federal law prohibits airport operators from siphoning off airport revenue for use in other projects, the PANYNJ is exempt from this statute under a grandfather clause, enabling the authority to use its relatively profitable airports (including JFK and EWR) to support and improve transportation facilities operating at a loss (including SWF). A joint planning study by the Port Authority and Metropolitan Transportation Authority envisions Stewart International — a low-volume facility located about 75-miles northwest of downtown Manhattan — will carry 7 MAP beginning in the 2030s, serving the Manhattan passenger market using direct bus rapid transit (BRT) and high-speed rail linkages. Using the Port Authority/MTA study, the Regional Plan Association estimates that integrating Stewart International within a multimodal regionalization plan might eventually shift more than 300,000 annual passengers away from the three current busiest Port Authority Airports (JFK, EWR, and LGA), and towards Stewart International (Regional Plan Association, 2011; 143).

New England Air Traffic Regionalization

In 1968, Congress mandated the FAA establish aircraft noise standards (82 Stat. 395; cf Cidell, 2004; 7). The agency's regulatory purview and enforcement powers increased over the next two decades until finally, following the passage of the Airport Noise and Capacity Act of 1990 (ANCA; 104 Stat. 1388-378), the FAA gained the power to overrule whatever locally-imposed capacity restrictions it deemed incompatible with the functioning of the national air traffic system — a regulatory power the agency still holds. The FAA may force local authorities to drop airport operating restrictions through a number of measures, most commonly by withholding federal assistance for airport improvement projects. While not explicitly designed to develop (or stymie) regionalization strategies, these regulatory powers have necessitated joint

private owner, thereby returning the airport to control by a public entity (Beauchamp and Warren, 2009; 18).
planning efforts in which airport operators and the FAA seek to resolve local issues with aircraft noise which do not also negatively interfere with air traffic at the national scale. Of these efforts, Boston's Logan International Airport (BOS) offers the most prominent example.

Logan International is in East Boston, only three miles from downtown Boston. The Massachusetts Port Authority, or Massport, has operated Logan International since 1956. In the two decades immediately following Massport's assumption of airport operations, the agency engaged in governance practices which alienated the residents of surrounding communities, poisoning future efforts to expand capacity. In 1967, for instance, Massport took control of the Frederick Law Olmsted-designed Wood Island Park — one of the area's only greenspaces — for the expansion of what would become the airport's longest runway (Dumanoski, 2001). In the wake of this and other eminent domain seizures of private property, residents of East Boston began more formal campaigns to resist airport expansion, often using the same public demonstration tactics commonly employed by the era's civil rights and anti-war campaigners.

Increasing air traffic and delays at Boston's Logan International Airport throughout the 1980s eventually forced the Massachusetts Aeronautics Commission to seek a site within the state for a secondary facility. The Commission concluded in their study that the state lacked the land area to accommodate such a facility.

The centrality of Logan International to New England air traffic networks, coupled with the historically-conditioned unlikelihood of expanded (or newly-commissioned alternative) facilities, made regionalization strategies attractive not only to Massport — who advocated approaches for “sharing the burden” of air travel's negative externalities, and authorities in jurisdictions offering beneficiary airports, but also to the potential passengers residing in the market areas of other regional airports, who might no longer need to make the trip to Boston for the bulk of their air travel needs (Cidell, 2005; 123-125). The busiest of these regional airports, T.F. Green International (PVD) — serving Providence, Rhode Island, about sixty miles southwest of Boston — handles a fraction of the passengers of Logan (just under 4 million in
2011 compared to just under 30 million at Logan in 2011). Another regional airport, New Hampshire's Manchester International (MHT), located about sixty miles northwest of Boston, provides only slightly less intense passenger operations than T.F. Green. Two other Massachusetts airports provide potential facilities to the regional system but lack significant commercial airline presence. Worcester Regional Airport (ORH), fifty miles to the west of Boston, has only offered spotty commercial passenger service over the past decade. A smaller facility to the northwest of Boston, Hanscom Field (BED), serves as a general-aviation airport and occasional reliever for commercial traffic.

Following a joint study conducted in 1995 by Massport and the FAA into the potential economic benefits of a regionalized air traffic approach, government and airport officials throughout New England agreed to pursue strategies for regionalizing New England air traffic. Among the measures to which the municipalities agreed included cross-marketing the airports of other, “competing” jurisdictions (Cidell, 1995; 125-126). The FAA also began authorizing limited commercial service out of Hanscom and Worcester. In 2000, for example, the FAA permitted Shuttle America to conduct roundtrip service between Hanscom and LaGuardia, in addition to other regional routes previously established by the airline at Hanscom (Massport, 2000). The regionalization strategy also included longer-term goals, including runway expansion projects (at BOS, MHT, PVD), new airport terminals (at MHT and PVD), and improvements in high-speed rail to complement aerial connections between New England and urban centers to the south, especially New York City. For their part, Massport sponsored an ad campaign outside Logan International which promoted air travel via other commercial airports in the region.

While regionalization succeeded insofar as the smaller airports received increased passenger volumes in the wake of these measures, it is unclear what effect airport and government officials had upon the redistribution of passenger volumes when compared with, for example, Southwest Airlines, which began service at T.F. Green in 1996 and Manchester in 1998 — coincident with the regionalization campaign (Cidell, 2004; 125). Moreover, as Cidell points
out, while the participating airport authorities agreed on the goals of regionalization, Massport diverged sharply from the others when it came to the form taken by regionalization:

*Massport sees the New England airports as part of one large system differentiated by function.* Logan will continue to handle international and long-haul domestic flights, Manchester and T.F. Green will handle short- and medium-haul flights (except for those in Logan's immediate market) as well as more cargo traffic, and Hanscom will handle general aviation and limited commercial service. Worcester has not attracted as many passengers as Massport would like, and its future role is unclear.

*At Manchester and T.F. Green, however, both directors see the system as differentiated by market area rather than by function.* Manchester is currently lengthening its main runway to 9000 feet to make possible non-stop flights to the West Coast. While Phoenix is the farthest-away destination that can currently be served non-stop, four of the top ten Manchester markets are on the West Coast. Manchester officials would also like to rearrange the New England air network, so that airports in Maine and Vermont connect through Manchester rather than Logan with their commuter service. (2004; 126)

Predictably, actors and communities in support of regionalization tended to be those adjacent to Logan International, while those opposed tended to be adjacent to Hanscom Field or other airport facilities with the potential for expansion beyond current capacity (Cidell, 1995; 127).

As with Boston, Los Angeles city-regional commercial passenger air traffic is overwhelmingly focused on a single facility, with several secondary facilities providing limited passenger service to domestic, regional, and (in a few cases) international markets. The following section outlines and maps the Los Angeles city-regional airport system, with particular emphasis on military facilities in the region that have been converted to civilian airports, have integrated joint military-civilian operations, or have been proposed or designated for conversion to civilian or joint use. I spend the bulk of this section providing background on Marine Corp Air Station El Toro, as well as establishing the political context which will be covered in more detail next chapter.
Los Angeles City-Regional Airports

In spite of the flattening of demand and the deconcentration of international air traffic routes involving Los Angeles, passenger air traffic to the city-region continues to increase each year. Taking cargo and general aviation traffic into account, the region still remains the densest concentration of airports and aircraft operations in the United States. The four major commercial airports in the city-regional core — BUR, LAX, LGB, and SNA — are severely limited not only with regard to current capacity but also to future expansion. Long Beach and John Wayne, for instance, operate under strict regulatory regimes which limit capacity and noise. These regimes remain viable because they predate the Airport Noise and Capacity Act of 1990 (49 U.S.C. Section 47521, 1990), which requires local communities to obtain federal approval for any such noise or access restrictions in the future.

All four airports are also spatially constrained. Bob Hope Airport (BUR), for example, still employs some of the most outdated passenger facilities in the United States: it is one of the last remaining commercial airports without boarding ramps or jet bridges; passengers must embark or debark aircraft via airstairs. The main runway at John Wayne Airport is 5,701-feet long — among the shortest of any commercial airport in the United States41 — and the airport itself occupies a cramped 501-acre site. Taken together, the four core facilities sit on just over a combined 5,500-acres, about two-thirds of which comprises LAX. The cumulative area of these four core airports is only slightly larger than 4,700-acre Hartsfield-Jackson, in Atlanta, and more than six times smaller than Denver International Airport, which sits on about 33,500 acres.

The airports in the Los Angeles city-region were situated and constructed to support aircraft whose optimal performance demanded far less from their facilities — including runway

41 For the sake of comparison: the shortest of ATL’s five runways is 9,000 feet, the shortest of LAX’s four runways is 8,925 feet, and the shortest of JFK’s four runways is 8,400 feet, and the two main runways at Wilmington, Delaware’s New Castle Airport both extend more than 7,000 feet.
capacities and obstacle clearance — than do contemporary jet airlines. Tellingly, many of these airports began as *airstrips*, constructed by the Department of Defense as coastal outposts for the Pacific Theater during the Second World War. The low capacities demanded by military aircraft of 1940s — and subsequent Cold War-era military aircraft, for that matter — meant they could safely and efficiently (but not quietly) operate from facilities situated immediately adjacent to densely-populated urban cores, or just beyond. The population of the Los Angeles city-regional core in the past several decades has expanded most rapidly along the periphery — including the counties of San Bernardino County, Orange, and Riverside — in areas within the catchment areas of Orange County's John Wayne Airport and the Inland Empire's LA/Ontario International Airport (United States Census 1990, 2000, and 2010). LA/Ontario — though constrained within its 1,700-acre site — is not subject to the regulatory regimes of the other airports (with some conditions, ONT allows 24-hour operations). John Wayne Airport, on the other hand, is perhaps the most spatially-constrained and heavily-regulated airport in the United States. Due to these constraints on current facilities and the prohibitive expense of constructing new airports from scratch, municipalities in Southern California have recently begun converting a handful of decommissioned military bases into passenger, cargo, or general aviation airports. In some instances, municipalities share tenancy of Department of Defense-owned facilities with their current military occupants under a joint-use agreement. Converted military, joint-use, and potential joint-use facilities in the Los Angeles city-region include:

Military facilities converted to civilian airports

- **San Bernardino International Airport** (SBD): owned and operated by the San Bernardino International Airport Authority (SBIAA). Summary below.

- **Southern California Logistics Airport** (VCV, but more commonly abbreviated SCLA): owned and operated by the Southern California Logistics Airport Authority (SCLAA). Summary below.
Joint-use airports

- **March Joint Air Reserve Base** (RIV): owned and operated by the US Air Force. The March Joint Powers Authority (JPA) formed in 1993 through agreement by the cities of Riverside, Perris, Moreno Valley, and Riverside County. In 1997, the Air Force agreed to share runway use and to lease a portion of the base facilities to the JPA. RIV has never offered scheduled passenger service, though from 2004 to 2008 leased a portion of its facilities to DHL for use as a cargo processing facility. Under the administration of the March JPA, the base itself remains open and available for use as a shared-use facility.

- **LA/Palmdale** (PMD): US Air Force Plant 42 is owned and operated by the US Air Force, which leases terminal and hangar space to Los Angeles World Airports. PMD has not offered scheduled commercial service since 2008.

Potential joint-use or civilian airports

- **Point Mugu Airport** (NTD): owned and operated by the US Navy. The entire facility sits on about 4,500 acres.

- **Los Alamitos Army Airfield**: owned and operated by the US Army. Sits on fewer than 1,500 acres.

San Bernardino International Airport (SBD) and the Southern California Logistics Airport (SCLA) offer the two recent examples of successful conversions from military to civilian facility, though they diverge in their functions within the regional system. San Bernardino International Airport serves mostly general aviation air traffic, and has the capacity to accommodate commercial passenger aircraft. Victorville's Southern California Logistics Airport (SCLA), on the other hand, serves as a cargo processing facility, primarily used by private carriers and the United States military. In the following section, I provide a very brief summary of each airport's military-to-civilian conversion process before beginning a more detailed discussion of the struggle over the conversion of Marine Corps Air Station El Toro.
San Bernardino International Airport

San Bernardino International Airport (SBD) is a single-runway commercial airport serving primarily general aviation and cargo air traffic. The nearly 15,000-acre site once housed Norton Air Force Base, whose closure in 1994 cost the city 10,000 jobs (Weinberg, 2007). The military handed control of the facility to two joint-power authorities sharing complementary responsibilities for site conversion and redevelopment: the Inland Valley Development Agency (IVDA) formed in 1990 to oversee development of non-aviation base assets, while the San Bernardino International Airport Authority (SBIAA) formed in 1992 to manage and develop aviation-related operations. Though SBD's lone runway can accommodate the largest commercial passenger aircraft, it has yet to handle any scheduled commercial passenger air traffic. This is due in large part to its distance from the city-region's densest urban cores, especially relative to other secondary airport facilities. For instance, not only does it take an hour on clear freeways to reach to downtown Los Angeles by automobile, but one passes another international airport — LA/Ontario — on the way. Its relatively remote location, along with the collapse of the global economy, have frustrated local government and business leaders' plans to market the facility as a low-cost alternative to other airports in the Los Angeles city-region. In 2007, only a year before the peak of the 2008 financial crisis, SBIAA had already spent “$34 million to refurbish the runway, $38 million for a new passenger terminal and $8 million to widen roads leading to the airport” (Kelly, 2007). The 2008 SCAG Regional Transportation Planned allocated 9.4 MAP to SBD in its 2035 regional air traffic forecasts.

The Southern California Logistics Airport

The Southern California Logistics Airport (SCLA) is a two-runway cargo airport owned and operated by the Southern California Logistics Airport Authority. The facility was initially constructed in 1941 as George Air Force Base, which closed in 1992. The former base property passed from the federal government to a newly-created reuse agency, the Victor Valley
Economic Development Authority (VVEDA), a joint-powers authority formed in 1989 by San Bernardino County, the city of Victorville, and two neighboring municipalities. The VVEDA plan for salvaging jobs lost to base closure provided land to the Federal Bureau of Prisons for the operation of a major prison complex, including two medium security institutions and a high security penitentiary. The military also continues to use base housing and other buildings for urban warfare training.

The centerpiece of VVEDA plans remained, however, the runway and its surrounding logistics facilities. VVEDA redeveloped and converted these assets into the Southern California Logistics Airport (SCLA) in the period immediately following base closure. In 1997, VVEDA delegated authority of SCLA to the City of Victorville. The city delegated ownership and operatorship of the airport to the Southern California Logistics Airport Authority (SCLAA), a joint-powers authority between the city of Victorville and the Victorville Redevelopment Agency. In June 2011, California Governor Jerry Brown signed into law a bill abolishing the state's 425 redevelopment agencies in the state, including the Victorville Redevelopment Agency. The state immediately froze the funds of all RDAs in the state and, because the city of Victorville had previously relied on these now-frozen RDA funds to cover its debt payments, the city defaulted on the payment of two SCLAA-issued bonds in December 2011. The defaults prompted Moody’s Investor Services to downgrade its ratings of SCLAA bonds to B3: a poor rating with the potential to inhibit Victorville from raising money through the issuance of additional bonds or to refinance its existing debt (Staggs, 2012). In the wake of the defaults and downgrades, the Securities and Exchange Commission has spent more than two years investigating the interfund borrowing practices of Victorville. In April 2013, the SEC filed a fraud complaint with the US District in Los Angeles, alleging that the city of Victorville, its bond underwriters, the SCLAA, and airport director Keith Metzler, knowingly issued bonds on airport
hangars whose value had been inflated by more than double, thereby misleading bond investors (Winburn, 2013).42

The 2,500-acre airport facility supports cargo operations on both runways, and is home to the logistics divisions of several major firms, which operate from an adjacent complex of manufacturing and distribution centers. Though the SCLA employs over 2,000 people across the various dimensions of its civilian airport activities, the facility continues to support military operations throughout the region. The facility serves, for example, as the primary arrival and departure facility for soldiers and equipment in rotation at the Army's Fort Irwin National Training Center, about 80-miles northeast. The only permanently assigned military personnel are housed in a recently-constructed hangar facility for the California Air National Guard's 163rd Reconnaissance Wing, among the first units to operate the MQ-1 Predator unmanned aerial drone (High Desert Daily, 2013).

Neither San Bernardino International nor the Southern California Logistics Airport have offered sustained, scheduled commercial passenger service. For the SCLA, this is by design; its remote location enables airport tenants to conduct 24-hour cargo operations. For San Bernardino International, the lack of scheduled commercial service — though certainly not intended — is also an outcome of its remoteness from the population centers of the Los Angeles basin, especially relative to nearby LA/Ontario International. Though military base conversion has proven successful within the region insofar as these two facilities have been transitioned to primarily civilian operations, but they have failed insofar as neither conversion has alleviated capacity at LAX or at any of the region's other major commercial passenger airports. Regional actors and planning groups have at various times advocated for a similar base conversion at one

42 Based on a cursory online search of SCLA operational news, the ongoing legal and financial turmoil surrounding Victorville and the SCLAA does not appear to have negatively affected airport operations, though it will likely limit operational expansion.
of the military facilities closer to the major population centers of Los Angeles and Orange Counties.

**MCAS El Toro**

Over the past several decades, the government of Orange County has convened numerous planning agencies and authorities charged to various degrees with proposing and evaluating sites for a second major county airport. This hypothetical alternative to John Wayne Airport is commonly referred to by media outlets and government officials as “OCX,” to emphasize the parallel importance such an airport would share with LAX, just one county north. One such agency, the Airport Site Coalition, convened periodically throughout the 1980s, sponsoring public meetings and soliciting citizen input in the creation of a list of (at one time, 24) sites for the potential OCX (Perlman, 1988). This and other airport site-selection agencies have often gravitated towards the ready-built — and therefore cost-effective — qualities of military airports, such as the converted Air Force bases in San Bernardino and Victorville. Moreover, a military base is often a major employer within its region. Decommissioned facilities can therefore provide local reuse authorities with a political imperative for retaining all or a portion of the civilian labor force by ensuring the converted facility requires skills they already have.

In their list for potential OCX sites, Orange County's Airport Site Coalition proposed a set of two-dozen or so potential potential locations, most of which lacked so much as a runway. Many of these non-airport sites came with NIMBY-politics 'baked-in': by virtue of their remote locations, proposed sites at places like Bell Canyon, Santiago Canyon, and the Lakeview Mountains, allowed the county to avoid tangling with local homeowners' associations. The list also included a handful of Orange County-based military facilities. Among these, Marine Corps Air Station El Toro would prove the most promising site for a future OCX. At the time of its inclusion on lists such as these, however, MCAS El Toro had served since 1943 as a primary air base for the United States Marine Corps. For most of its service life El Toro was the largest such
installation on the West Coast. Orange County could only officially campaign to convert the site to a civilian airport only if the Base Realignment Commission decided to decommission the air base.
MCAS El Toro Background

The Marine Corps, under the command of the Department of the Navy, began occupying the site in 1942 after the Navy purchased 2,319 acres of farmland from the Irvine Company, a privately-held real estate development firm whose vast landholdings date to the Irvine Ranch, founded in 1864. The facility began airfield operations in March 1943, after which the Marine Corps purchased additional acreage, bringing El Toro's terrestrial footprint to just over 4,700 acres. El Toro is situated in the first gentle rises of the Lomas de Santiago foothills, just where the Los Angeles Basin — the vast coastal plain crowded with most of the region's inhabitants — begins giving way to the Santa Ana Mountains. El Toro is tucked into a corner of all this, such that the bulk of the Santa Ana range rises to the east and another landform, Loma Ridge, rises very quickly to the north. To the south and west of El Toro, the Los Angeles Basin slopes evenly, downwards towards the coastline.

For much of its first two decades, the broader region affected by air base operations remained sparsely populated, unincorporated farmland. But the Los Angeles region continued to intensify development of its already well-established industrial base, becoming the undisputed seat of defense-related and non-defense related research and development spending by the federal government at the height of the Cold War (Malecki, 1982). The region's strong culture of automobility and the postwar demand for cheap land on the periphery of highly-developed southern Los Angeles fed the growth of a handful of Orange County population centers which had incorporated long before the start of the war (see Figure 22, following page), including the North County cities of Anaheim (incorporated in 1870), Santa Ana (1886), and Orange (1880). In many instances, however, the automobile allowed residents to settle in still newer developments, which reshaped many small communities dotting rural, unincorporated Orange County. Of the 34 current incorporated cities in Orange County, 13 formed prior to 1928. Another 13 incorporated between 1953 and 1971, including six in the three years between 1965

**Figure 22** Incorporations in Orange County by year. (Each circle represents one incorporated city.  

43 Sources: Olin (1995) for the dates of pre-1989 incorporations; author's research of town histories for Anaheim and all other incorporations. One additional note: the California legislature approved incorporation for the city of Anaheim in 1870, revoked the charter in 1872, and re-approved incorporation again in 1876.
The most intensified sociospatial development during the immediate postwar era occurred in North County communities, whose proximity to the employment centers of southern Los Angeles attracted middle-class commuters making use of the newly constructed Santa Ana Freeway (Kling et al., 1995; 5).

Development throughout the whole of the county since the 1940s and 1950s has exemplified the decentralized (or multicentric) settlement pattern of the postwar (postmodern) American landscape (Gottdiener and Kephart, 1995). The population of Orange County has multiplied fifteen times since 1950, from the 200,000 residents scattered throughout rural communities and farmland settlements — and only a handful of small cities — to over 3 million residents within a deconcentrated regional landscape comprised of no less than twenty-eight coherent urban settlements (Kling et al., 1995; 5-6; United States Census Bureau, 2010). The region's most rapid period of urbanization occurred during the first few decades after the Second World War. The population more than tripled from 1950 to 1960, and doubled again between 1960 to 1970. Much of the growth during the postwar era spread throughout North County communities, particularly in and around Anaheim, whose population expanded over 600% between 1950 to 1960 — from 14,000 to 104,000 residents. In summer 1955, Walt Disney opened Disneyland near Anaheim. During that first half-season, the park welcomed 1.2-million visitors. The next year — the first full season — saw 3.8-million visitors. Attendance doubled by 1967, when the park hosted 7.8-million visitors, and remained at around 10-million in attendance each year through the 1970s (Sampson, 2010). In 2011, the park received just over 16-million visitors, making it the second busiest theme park in the world (roughly 1-million visitors fewer than Disney’s Magic Kingdom, in Florida). According to the 2010 US Census Bureau, Anaheim remains the largest city in Orange County (see Figure 23, following page). Among the

largest and most politically active South County communities — including Irvine, Mission Viejo, Lake Forest, and four others\(^45\) — the cumulative population was 532,341 in 2010, or a little more than 17-percent of the current Orange County population. As the table above indicates, however, Orange County lacks a centralizing urban core. Though Santa Ana and Anaheim have served as historical centers for the political, cultural, and economic life of the county — with Anaheim's Disneyland at its core, since the end of the Second World War, Irvine and other cities have become political-economic centers in their own right.

**Figure 23** The 15 most populous Orange County cities, unincorporated community population, & total county population.

<table>
<thead>
<tr>
<th>Municipality</th>
<th>2010 pop.</th>
<th>% county pop.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anaheim</td>
<td>336,265</td>
<td>11.2</td>
</tr>
<tr>
<td>Santa Ana</td>
<td>324,528</td>
<td>10.8</td>
</tr>
<tr>
<td>Irvine</td>
<td>212,375</td>
<td>7.1</td>
</tr>
<tr>
<td>Huntington Beach</td>
<td>189,992</td>
<td>6.3</td>
</tr>
<tr>
<td>Garden Grove</td>
<td>170,883</td>
<td>5.7</td>
</tr>
<tr>
<td>Orange</td>
<td>136,416</td>
<td>4.5</td>
</tr>
<tr>
<td>Fullerton</td>
<td>135,161</td>
<td>4.5</td>
</tr>
<tr>
<td>Costa Mesa</td>
<td>109,960</td>
<td>3.7</td>
</tr>
<tr>
<td>Mission Viejo</td>
<td>93,305</td>
<td>3.1</td>
</tr>
<tr>
<td>Westminster</td>
<td>89,701</td>
<td>3.0</td>
</tr>
<tr>
<td>Newport Beach</td>
<td>85,186</td>
<td>2.8</td>
</tr>
<tr>
<td>Lake Forest</td>
<td>77,264</td>
<td>2.6</td>
</tr>
<tr>
<td>Tustin</td>
<td>75,540</td>
<td>2.5</td>
</tr>
<tr>
<td>Yorba Linda</td>
<td>64,234</td>
<td>2.1</td>
</tr>
<tr>
<td>San Clemente</td>
<td>63,522</td>
<td>2.1</td>
</tr>
<tr>
<td><strong>Unincorporated</strong></td>
<td><strong>32,726</strong></td>
<td><strong>1.1</strong></td>
</tr>
<tr>
<td>County Total</td>
<td>3,010,232</td>
<td></td>
</tr>
</tbody>
</table>

\(^{45}\) The four others include Dana Point, Laguna Niguel, Laguna Hills, and Laguna Beach. Together, these seven communities comprise an organization of South County communities which will eventually constitute the most significant municipal counterweight to the Anaheim- and Newport Beach-led pro-airport coalition of North County communities.
Today, Anaheim and Santa Ana contain about 10-percent of the total county population each, the next five largest cities comprise anywhere from 4.5- to 7.1-percent. By way of contrast, the politics and economies of the counties to the north and south of Orange County (the counties of Los Angeles and San Diego, respectively) are organized around the largest jurisdictionally-defined cities within each (the cities of Los Angeles and San Diego, respectively). Relative to its neighboring counties, therefore, the political, economic and cultural production of Orange County was bipolar until at least the Second World War (clustered around both Anaheim and Santa Ana) and, in recent decades, multipolar (including Irvine and other municipalities).

Following the Second World War, population growth and development of the rural communities in the south of Orange County lagged about a decade behind that of communities closer to Los Angeles, in the north. Beginning in the late-1950s and early-1960s a handful of large developers laid the groundwork for strictly-zoned, highly-planned residential communities throughout the many orchards, farms, and ranches to the southeast of rapidly-urbanizing Anaheim and Santa Ana. The Irvine Company, for example, donated 1,000 acres of the Irvine Ranch to the University of California system, which needed more space to accommodate the influx of college students as a result of the G.I. Bill and the postwar baby-boom.\textsuperscript{46} UC Irvine admitted its first students in 1965. The city of Irvine incorporated just six years later as a community of 10,081 people. Within a decade, the population had grown some 500-percent (United States Census, 1980). In another three decades, 223,000 residents called Irvine home, making it one of the hundred largest urban centers in the United States. Once situated in the remote periphery of Los Angeles — among farmland, orchards, and the foothills of the Santa Ana Mountains — El Toro had become hemmed in on nearly all sides by one of the most intense concentrations of postwar residential growth in the United States.

\textsuperscript{46} The Irvine Company benefited from the sale of the land, as the value of its nearby property increased dramatically with the establishment of a major new campus.
In addition to becoming densely urbanized, the economy of El Toro's South County surround has also become tightly integrated within networks of global capital, especially those related to high-technology and medical research and development. Several of the largest American firms within these industries have headquarters in Irvine, including computer hardware manufacturer Gateway, Inc., hard disk manufacturer Western Digital, consumer electronics manufacturer Vizio, semiconductor manufacturer Broadcom, pharmaceutical company Allergan, and Blizzard Entertainment, a subsidiary of Activision Blizzard, the second largest video-game studio after Nintendo. Irvine also serves as the North American headquarters for several multinational corporations, including Kia Motors, Mazda Motors, and Toshiba Electronics. High-technology firms such as these have been a relatively stable source of employment and trade across Orange County for more than three decades. In light of its position within the knowledge economy — particularly within West Coast research and design networks — the United States Bureau of Export Administration chose Newport Beach in 1988 to host its first export licensing office outside of Washington, DC. Before the satellite office opened, West Coast firms relying on international orders had to contend with a three-hour time difference and long wait-times for export licenses from the headquarters office, losing potential customers to East Coast firms (Tighe, 1988; Kling et al., 1995).

By the early 1980s, only land to the northwest of El Toro retained primarily agricultural use. The areas to its northeast and south increasingly accommodated light-industrial, commercial, and residential developments. This intensifying urban surround compromised the Marine Corps' use of El Toro as a center for (noisy) jet operations. The contraction of the military in the post-Cold War era also diminished the need for MCAS El Toro and MCAS Tustin, a nearby helicopter base, to be operated as separate facilities in such close proximity. The political and financial costs to the Pentagon of operating the two air stations in heavily populated Orange County had become too great, especially weighed against the potential for consolidated operations within a single, more remote facility. Moreover, for nearly two decades, business and
municipal interests from across the region had been investigating sites and proposing recommendations for a second Orange County airport for supplementing John Wayne Airport (SNA), whose relatively short runway precluded many types of large commercial aircraft and whose stringently-enforced operating restrictions limited the ability of Orange County to share in regional air traffic flows. As noted, the planning agencies conducting these site investigations invariably proposed El Toro as one of a handful of prime locations for a future OCX.

In the summer of 1993, the Base Realignment and Closure (BRAC) Commission announced the closure of MCAS El Toro. The BRAC commission ordered the Department of Defense to consolidate the operations of the air base with those of MCAS Tustin on the grounds of the former Naval Air Station Miramar, ten miles north of downtown San Diego. The gradual transfer and consolidation would begin immediately, concluding with El Toro's official closure in July 1999. The federal government set aside funds to assist the local reuse planning process and provide environmental restoration of the site; the Pentagon would distribute these funds only after the state of California designated a local authority to receive them.

Regional Stakeholders

BRAC-related legislation requires retired military bases be formally transferred from their federal titleholder to a state- or municipally-designated Local Redevelopment Authority (LRA), which itself must receive final approval from the Department of Defense (cf Stats. 1994, c. 1261, section 6; Gov. Code, subsection 67840, 67842). Soon after the closure announcement, 47

47 The Defense Authorization Amendments and Base Closure and Realignment Act (10 U.S.C. § 2687 et seq.) establish the legal form an LRA must take. A brief submitted by Orange County in its litigation against Measure W references the most relevant section of United States code (b)(7)(F)(i) and section 2910): Both the choice of the LRA and the contents of the Community Reuse Plan must be approved by the Secretary of Defense in order for the former military base property to be transferred to the state or local entity. (10 U.S.C. section 2687 (P.L. No. 101- 510, section 2905(b)(4)(A)
in March 1994, Orange County and the cities of Irvine and Lake Forest agreed to form the El Toro Reuse Planning Authority (ETRPA), a joint powers authority responsible for the eventual development, approval, and submission of a reuse plan to the Department of Defense (Clerk of the Board, 1994). This initial version of the ETRPA consisted of nine members total: five representatives from Orange County, three from Irvine, and one from Lake Forest (Assembly Bill 37, 1994). In August 1994, the California state legislature designated the ETRPA as the single reuse authority for El Toro, enabling it to receive state and federal assistance for the reuse planning process and environmental rehabilitation, as well as the eventual transfer of the base itself. The ETRPA still required final designation from the Pentagon to become the federally-recognized LRA for the site, however. Once approved, federal law would require the ETRPA to develop, approve, and submit a Community Reuse Plan (CRP) for El Toro, which would also be subject to final approval by the Pentagon (cf Stats. 1994, c. 1261, section 6; Gov. Code, subsection. 67840, 67842). Within the first few meetings, ETRPA members representing the city of Irvine clashed with county representatives over the apportionment of leadership roles on the authority. County members insisted that the posts of chairman and vice chairman be filled for the life of the authority only by members representing the county (Johnson, 1994). The city of Irvine argued that because El Toro lay within Irvine's sphere of influence, one of the top two seats should be filled by a member representing Irvine.

Infighting within the nascent ETRPA served as a microcosm — or, rather, a glimpse into the future — of what would rapidly develop into a broader political struggle between competing

48 California established Local Agency Formation Commissions (LAFCO) in 1963 for regulating the formation and growth of local governments. The state charges each of the 58 county LAFCOs with determining the boundaries for cities within its jurisdiction, and for recommending changes to the spheres of influence for each, defined as “an agency’s probable future physical boundary and service area,” or the area a city will likely annex given current growth trends (Bui and Ihrke, 2003).
visions of Orange County's sociospatial development. Generally speaking, these visions coalesced, on the one hand, around pro-airport North County interests and, on the other hand, around anti-airport South County interests. Immediately following the base closure announcement, airport proponents began enlisting ready-made (in many cases, dormant) constituencies from which to draw support and funding — these groups constituted and reconstituted at various moments from the early-1970s onwards, usually to develop alternatives to John Wayne Airport. The Orange County Board of Supervisors governed all unincorporated county land in the county, giving them the safest claim to all of El Toro but the approximately 300-acres within Irvine's jurisdictional boundaries. From the outset, the county’s claim to control of the site as unincorporated land, along with the 3-2 board majority in favor of airport reuse, formed the core around which the pro-airport coalition coalesced. Several Orange County municipal alliances and various business groups — some longstanding; others ad hoc — rounded out the remainder of a geographically expansive and well-funded pro-airport coalition.
Chapter 5

TOWARDS AN URBAN AERODYNAMICS

We do not ride on the railroad; it rides upon us.

— Henry David Thoreau (1854/1999; 74)

There is a politics of space, but not simply because there are political disputes over space, that space and spatial relations cannot be understood without a political context. There is a politics of space, but it is similarly not enough — though I hope it is a useful step — to suggest that politics must play out in a spatial frame. There is a politics of space, most fundamentally, because space is constitutive of the political. Our very definition of the political — the framework within which, or the ground upon which, anything that bears the name of politics occurs — must be able to take account of the constitutive relations of the social, historical and spatial.

— Stuart Elden (2004; 99–100)

My joke is that all my issues begin with air: airport, Air Force, air quality — all the time.

— California Assemblyman Mike Gordon, former mayor of El Segundo (Gardner, 2004)

Introduction

The El Toro reuse struggle brings together two sociospatial dimensions, both of which condition and emerge from aerial-spatial production and the interactions among its attendant actors, practices, and infrastructures. The first of these dimensions relates to the material spatial practices *predicating* flight; the second, to the material spatial practices of flight itself. The former takes shape primarily according to antagonisms among urban political-economic
interests; the latter, according to antagonisms that arise as an aircraft-in-motion interacts with its environment, including the physical forces, hazardous terrain, and atmospheric conditions which constitute an ecology of flight for any point along its trajectory. As with any dimension of urban sociospatiality, these two unfold in practice as messy, overlapping relationships among the people and objects comprising the city.

The first of these dimensions relates to the politically negotiated distribution of aerial spatial production throughout city-regions. Within the context of Los Angeles passenger aeriality, the antagonisms shaping this dimension encompass the competing demands placed upon city-regional aerial space by those actors involved in its production. Regionalization of air traffic has become one such demand placed upon the production of aerial space for the Los Angeles city-region, albeit with less successful results than the Boston implementation I cited in the previous chapter. The second of the two dimensions emerges from heavier-than-air aircraft 1) in dialectical performance with the physical forces that sustain (or disable) powered flight (e.g., lift and gravity) and, 2) in negotiation with terrestrial and aerial hindrances to flight (e.g., steep mountains and wind shear). Within my discussion of passenger aeriality, this dimension most often manifests at the point where the imperatives of commercial aviation — i.e., that planes fly far enough, full enough to generate profits — intersect with those of flight safety regulations — which demand that these same profitably-loaded airplanes remain light enough to achieve lift while carrying fuel enough to reach their destinations.

This chapter addresses these two sociospatial dimensions of aerial spatial production as they apply to the reuse of El Toro. The chapter is organized into three sections. The first describes the protracted political process surrounding El Toro's reuse, which pitted the interests of a pro-airport coalition of primarily north Orange County communities against an anti-airport coalition composed primarily of those south Orange County communities neighboring El Toro. This section opens with an outline of the institutional actors comprising each of these coalitions, before detailing the ballot-box planning process as it transpired over the course of four ballot
measures submitted to Orange County voters between the years 1994 and 2002. The second section addresses the attempts by regional actors to impose sanctions upon communities that have avoided producing their “fair share” of aerial space. I summarize the extent of these regionalization policies as they have been implemented for Los Angeles city-regional air traffic, and of how many of these regionalization planning efforts integrated passenger service at the proposed El Toro airport. The third section details the relationship between the proposed El Toro site configuration and its physical-ecological surround. Using the political conflict over El Toro as an illustration, this section considers how cities become shaped by the aerial processes related to passenger air travel. Any discussion of the political dynamics by which city-regional actors build and maintain a terrestrial system of airports must also take account of how, precisely, these sites and their processes perform aeriality. This accounting constitutes an urban aerodynamics.
As early as the 1970s — long before the BRAC Commission announced the closure of El Toro — communities and homeowners associations in the North County and South County communities such as Newport Beach, located directly beneath the flight corridors of John Wayne Airport, began advocating for a second county airport (see Figure 24, above, for Orange County communities in relation to JWA and El Toro). One of these advocacy organizations, the Airport Working Group of Orange County (AWG), began in 1982 as a nonprofit organization of Newport Beach Homeowners Associations which sought to limit aircraft noise and other
pollutants from John Wayne Airport. The AWG was involved in the 1985 settlement agreement, which imposed heavy restrictions on the airport's passenger volumes, terminal and departure lounge square-footage, automobile parking capacity, aircraft departure frequencies, operating hours, and noise levels (John Wayne Airport, 2013). The original signatories — Orange County (the owner/operator of SNA), the city of Newport Beach, the AWG, and the citizen's organization Stop Polluting Our Newport — renegotiated the original agreement in 2003 to allow for modest operational expansions. The amended agreement expires in 2015.

Municipal advocacy on either side of the reuse issue took the form of coalitions, alliances, and study groups. A number of joint-power authorities — along with the Orange County Board of Supervisors — proved the most active and influential participants during the struggle, and included the Orange County Regional Airport Authority (OCRAA) and Southern California Regional Airport Authority (SCRAA). One influential stakeholder group, the Airport Site Coalition,\(^49\) formed and dissolved before the base closure announcement took place, but not before recommending El Toro — along with 23 other facilities throughout the county — as potential sites for a second county airport. Also prior to the reuse struggle, homeowner groups in the city of Irvine and other communities nearby El Toro had already begun forming in opposition to the facility's potential aviation reuse (Perlman, 1988). Figure 25 (next page) outlines the primary actors in favor of airport reuse, either for the duration of the struggle or for certain portions of it. The following section offers a brief summary of each.

\(^{49}\) The Orange County Board of Supervisors authorized the Airport Site Coalition.
Figure 25  Actors and institutions in favor of airport reuse for El Toro

Orange County Regional Airport Authority

OCRAA originally formed in 1974 through joint agreement among Anaheim and four other North County cities. Its original purpose was to investigate sites for a second county airport. In 1993, the North County cities of Garden Grove, Los Alamitos, and Stanton reestablished the Orange County Regional Airport Authority (OCRAA) for the purposes of planning a second Orange County Airport at one of several potential sites throughout the county, including El Toro and Chino Hills (Los Angeles Times, 1993; Hamashige, 1998). Newport Beach and Anaheim, two municipalities deeply invested in building a second Orange County Airport, sought participation within the ETRPA but were omitted from joining the authority. The board of supervisors opted instead to form the authority board around five members representing the county itself and a total of four representing the two communities nearest El Toro, including three Irvine representatives and one from Lake Forest (Elston, 1994). The OCRAA offered
Orange County communities locked out from participation on the ETRPA a formal platform from which to lobby for the airport reuse option in the event that the ETRPA favored the interests of Irvine and Lake Forest — the board of supervisors at this time still held only a 3-2 majority in favor of airport reuse.

The South County's Newport Beach community embraced the OCRAA as a political counterweight to the ETRPA, joining the authority in early 1994. Anaheim also joined in 1994, with the backing of its Chamber of Commerce, an organization representing the city's well-established tourism industry. Anaheim is home to a major convention center, two professional sports facilities, and the massive Disneyland Resort complex, which itself provided almost 15% of total employment for the city in 2010 (City of Anaheim, 2010). Disneyland also serves as a major source of Orange County passengers using LAX. A LAWA-sponsored survey of LAX origin passengers in 2006 found that, while residents and visitors alike were more likely to originate their trips from Los Angeles County, a higher proportion of residents originated in Los Angeles County than did visitors. The opposite was true of Orange County, from which originated a higher proportion of visitors than residents making use of LAX. The same survey performed five years earlier arrived at similar results: residents were more likely than visitors to originate their trips from Los Angeles County, while Orange County had a higher proportion of visitors than residents. In short, the share of LAX passenger air traffic associated most strongly by Orange County has been more tourist- or visitor-oriented than that associated most strongly

50 The 2006 LAWA study found that, of the surveyed passengers (n=15,892), nearly 56% originated as residents of surrounding counties, with about 44% originating from the surrounding counties as visitors to the region. Of the group of residents, 79% originated from Los Angeles County (compared with 76% of visitors). Orange County, on the other hand, had a higher proportion of the visitors. Of the group of visitors, 15% percent originated in Orange County (compared with 11% of residents). The 2001 LAWA study found that, of the surveyed passengers, Los Angeles County had a share of 75% of regional residents and 73% of regional visitors; Orange County had a share of 18% of the visitors and 13% of the residents.
with Los Angeles County. Both surveys cite Orange County's Disneyland (and, to a lesser extent, other Orange County-based tourist attractions, including Knott's Berry Farm) as a reason for the discrepancy.

Anaheim and its surrounding urban region also have a strong base of high-technology manufacturing, particularly in Anaheim Canyon, the largest industrial park in Orange County (Zimmerman et al., 2006). The city joined the OCRAA over early concerns that the ETRPA (as initially designated) would cede too much decision-making power over El Toro's reuse to the city of Irvine, potentially endangering the market access a second Orange County airport might entail (Lait, 1994).

When the pro-airport Measure A ballot initiative won in 1994, it stripped the authority to plan for a second Orange County airport from OCRAA and transferred it to the Orange County Board of Supervisors (see Figure 26, on the following page, for a timeline and summary for this and subsequent El Toro-related ballot measures51). Without the ability to directly influence the planning process the OCRAA went dormant until 1998, when Anaheim Mayor Tom Daly began asking North County cities to renew their membership (Hamashige, 1998). Newport Beach also helped reconstitute OCRAA, devoting city funds to the authority and installing its assistant city manager, Peggy Ducey, to serve as OCRAA's executive director (Pasco and Ebnet, 1999). Daly and Ducey together envisioned the authority as a vehicle for building municipal consensus around airport reuse. Over time OCRAA grew to include as many as 15 members — most from

51 The Orange County ballot initiative process falls under California State Elections Code. Briefly, the mechanism is as follows: after notifying the County Registrar of Voters (ROV) of their intent, proponents of an initiative must circulate a petition and gather the signatures from a predetermined percentage of county voters (based upon turnout in a previous election). Proponents must file their petition with the ROV, who verifies the signatures. If the ROV certifies the initiative petition, the Board of Supervisors must either adopt the ordinance in question or submit it to county voters for approval during either a regular or special election (California Elections Code, sections 9100–9126 and 1400–1405).
the North County — though Newport Beach remained its most central actor throughout the process.

Figure 26  Chronology of El Toro-related ballot measures

<table>
<thead>
<tr>
<th>Name</th>
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<th>Official Initiative title</th>
<th>Summary of initiative</th>
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<td>Orange County/El Toro Economic Stimulus Initiative</td>
<td>Amended the Orange County General Plan to designate MCAS El Toro for conversion to a commercial airport. Created the 13-member Citizens Aviation Advisory Commission (CAAC).</td>
<td>51      49</td>
</tr>
<tr>
<td>Measure S</td>
<td>1996</td>
<td>Initiative to Amend the Orange County General Plan to Repeal Measure A and Designate El Toro Marine Corps Air Station for Highest and Best Uses, Not Limited to Commercial Aircraft Uses</td>
<td>Repealed Measure A, abolished the CAAC, and designated MCAS El Toro lands for use according to “their highest and best uses, not limited to commercial aircraft uses.”</td>
<td>40      60</td>
</tr>
<tr>
<td>Measure F</td>
<td>2000</td>
<td>The Safe and Healthy Communities Initiative</td>
<td>Required jail, landfill, and airport projects to achieve ratification by two-thirds of Orange County voters.</td>
<td>67*     33</td>
</tr>
<tr>
<td>Measure W</td>
<td>2002</td>
<td>The Orange County Central Park and Nature Preserve Initiative</td>
<td>Amended the Orange County General Plan to designate MCAS El Toro for conversion to “non-aviation uses, including a multi-purpose central park.”</td>
<td>58      42</td>
</tr>
</tbody>
</table>

*Later overturned after being declared unconstitutional by Los Angeles Superior Court.

In spite of Orange County voters approving Measure W in 2002, effectively overturning the airport reuse plan as implemented under Measure A, OCRAA continued lobbying for an El Toro airport. In July 2003, for instance, OCRAA officially endorsed a City of Los Angeles plan by which the Department of Transportation would acquire El Toro and lease it to LAWA for use as a commercial airport (OCRAA, 2003). The resolution called for:

the Department of Transportation, and the Department of the Navy to provide a fair hearing of the request by the City of Los Angeles to operate a commercial airport at El Toro by taking into consideration the transportation needs of the
region, the economic benefits of an airport at El Toro to the local, state and national economy, and the benefits of an airport at El Toro to homeland security. (OCRAA, 2003)

Despite its embrace of so radical a position, the endorsement carried little political weight so late in the process. By the time of its release, many municipalities had withdrawn or were in the process of withdrawing membership from OCRAA; Anaheim, for its part, withdrew only a month later.

Southern California Regional Airport Authority

The Southern California Regional Airport Authority (SCRAA) — a similarly airport-oriented regional authority — formed in 1985 as a multi-jurisdictional joint powers authority with representatives from the city of Los Angeles, and the counties of Los Angeles, Riverside, and San Bernardino (Erie et al., 2006). Whereas OCRAA formed to plan for (and potentially develop) a second Orange County Airport, SCRAA formed to support policies and practices enabling a more equitable distribution of air traffic across the current set Southern California airports. The SCRAA's most preferred among such measures — though certainly also the most difficult to implement — included the development of additional airport capacity, either by lifting capacity limits and curfews, or through airport construction and expansion. At the time of its formation the other members asked Orange County to participate but it declined, eventually joining in 1992 on the condition that individual SCRAA members could veto decisions made by the collective (Newton, 1991). The SCRAA has gone dormant during periods of relative consensus on airport and air traffic issues. For instance, the organization convened regularly from its inception in 1985 until about 1992 but fell into disuse as the El Toro struggle introduced new antagonisms between its member municipalities, leaving little overlap among the various positions taken by each.
Business Alliances

The Orange County Business Council and other regional business leaders and alliances supported the airport coalition, if only by funding the various pro-airport campaigns leading up to the four El Toro-related ballot initiatives from 1994 to 2002. The business community also provided perhaps the single most powerful voice throughout the first half of the El Toro reuse struggle, in real estate billionaire (and Newport Beach resident) George Argyros. Already a major donor and fundraiser for the Republican Party, Argyros devoted considerable amounts of his own fortune and time in support of an El Toro airport. The Los Angeles Times once noted of his role in the pro-airport campaign, “if El Toro is a war, Argyros is the general” (Granelli, 1998). Though many of his fellow airport supporters viewed Measure A as a risky move so early in the process, Argyros was the chief supporter of the petition drive to secure the ballot initiative in time for the November 1994 elections (Martinez, 1994). Measure A's passage created the El Toro Citizens Advisory Commission (CAC) and Argyros secured appointment to one of its thirteen-seats. He soon becoming “the de facto chairman”52 of the CAC, a board of citizens designed to review all plans and advise the ETRPA during the planning process. All told, Argyros spent about $3.5 million of his own money promoting the airport, not only by bankrolling Measure A but also funding campaigns to defeat the three other ballot measures opposing airport reuse (Pasco, 2000). In 2001, George Argyros departed the pro-airport coalition to become ambassador to Spain for the Bush administration. The LA Times noted “the tenor of the debate changed” with his departure, tilting the balance towards the anti-airport coalition (Martelle, 2002; no pagination).

Southern California Association of Governments

Though not as direct an actor in the El Toro struggle as many other municipal alliances, the Southern California Association of Governments (SCAG) included El Toro in a major transportation plan and called on its aviation reuse as a solution to the region's air traffic capacity issues. As the state- and federally-designated metropolitan planning organization (MPO) for the greater Los Angeles area, SCAG served as prime author for federally-mandated regional plans for a six-county region, including the counties of Los Angeles, Imperial, Orange, San Bernardino, Riverside, and Ventura. SCAG is the largest of some 700 MPOs in the United States. The organization's primary planning duty includes producing a periodic regional transportation plan (RTP): a blueprint for allocating local-, state-, and federal-funding of regional transportation projects based on long-term demographic and socioeconomic forecasting. In its 2001 RTP, SCAG called for air passenger caps on both LAX (at 78 million air passengers, or MAP) and SNA (at 8.9 MAP) and endorsed a 30 MAP airport at El Toro — less than the 38 MAP from the Orange County Board of Supervisors' 1996 draft plan but slightly more than the 28.8 MAP from their October 2001 final plan (Pasco, 2001). In response to this RTP and its associated environmental impact report (EIR), airport opponents filed suit against SCAG under the California Environmental Quality Act (CEQA) in late 2001, claiming that the plan failed to fully account for the adverse environmental impacts of a new facility providing air service for nearly 30 MAP (Pasco, 2001).\textsuperscript{53} SCAG's endorsement of a large commercial airport at El Toro proved to be one of the key leverage points available to the pro-airport coalition, especially in the later stages of the reuse struggle.

\textsuperscript{53} In the wake of Measure W's ratification in 2002, SCAG agreed to remove El Toro from its updated Regional Transportation Plan. In exchange, ETRPA and other airport opponents backed down from litigation.
Department of Defense

The Department of Defense bore no legal obligation to cede reuse planning authority to any other agency. It alone reserved final decision-making power over any state, county, or local government bodies involved. Though BRAC-related legislation outlined a mechanism for federal-to-local transfer of property, the Department of Defense need not transfer the base in the first place. The Pentagon retained the option of keeping El Toro on its books indefinitely, either to reuse for military purposes later or until an acceptable local authority developed consensus around a reuse plan. Indeed, at several points during the decade-long controversy, the Pentagon threatened withdrawal from the process altogether (Reza, 1995; Reza and Grad, 1995). Though the Department of Defense made clear its preference for the airport reuse option, in practice it supported local consensus-building through, for example, making federal funds available to the LRA contingent upon its consideration of alternative reuse plans for El Toro (Johnson and Martinez, 1993).

Anti-Airport Coalition

About 300 acres of El Toro resided within the jurisdictional boundaries of the city of Irvine. The remainder of the facility lay within Irvine's sphere of influence. Lake Forest, the next closest incorporated municipality to the base, lay only about 2 miles to the southeast of El Toro. The four combined ETPRA representatives from these two municipalities provided a political counterweight to the five members representing the county of Orange, whose board of supervisors favored the creation of a commercial airport on the El Toro site by a narrow 3-2 margin. The two South County cities represented within the ETRPA formed the core of opposition around which a more diverse set of primarily grassroots organizations coalesced, including homeowners associations and environmental-rights organizations, such as Citizens for Safe and Healthy Communities. Irvine resident Leonard Krasner created a website in 1996 called The El Toro Info Site (eltoroairport.org), which served as a clearinghouse for planning
documents, legal filings, and news related to the airport planning process and opposition to it (ElToroAirport.org About Page, 2012). Figure 27 outlines these and other opponents of airport reuse, which are discussed in further detail below.

Figure 27  Actors and institutions opposed to the airport reuse of El Toro

<table>
<thead>
<tr>
<th>Actor or Institution</th>
<th>Acronym</th>
<th>Years Active in Coalition</th>
<th>Form of Authority</th>
<th>Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>El Toro Reuse Planning Authority</td>
<td>ETRPA</td>
<td>Formed in 1994; active throughout</td>
<td>Joint-powers authority</td>
<td>ETRPA eventually grew to represent seven South County municipalities*</td>
</tr>
<tr>
<td>Larry Agran</td>
<td>—</td>
<td>Throughout</td>
<td>Former mayor of Irvine &amp; influential public figure</td>
<td>—</td>
</tr>
<tr>
<td>El Toro Info Site (elторoaирпорт.org)</td>
<td>—</td>
<td>Created in 1996; active throughout</td>
<td>—</td>
<td>Created and maintained by Irvine resident Leonard Krasner</td>
</tr>
<tr>
<td>Project '99</td>
<td>—</td>
<td>Formed in 1996; active throughout</td>
<td>Nonprofit organization</td>
<td>Leaders and residents of Orange County, primarily from South County communities</td>
</tr>
</tbody>
</table>

* The Orange County Board of Supervisors voted in 1994 to withdraw from the ETRPA in order to plan for the airport reuse of El Toro. This left Irvine and Lake Forest, who eventually added Dana Point, Laguna Niguel, Laguna Hills, Laguna Beach, and Mission Viejo.

The single most visible and influential opponent of airport reuse, Larry Agran, served as Irvine's mayor from 1983–1989 (and again from 2001–2005), providing the anti-airport coalition with a high-profile counterbalance to George Argyros. Agran, an outspoken progressive politician, remains an unusual animal in typically-conservative Orange County politics

54 In 2005, the Bay Area Center for Voting Research published an analysis of voting patterns among individual US cities whose 2000 Census Bureau estimated populations exceeded 100,000 people. They based their ranking of conservative cities on the percentage of the electorate within each city voting for a conservative candidate (i.e., George W. Bush or some third-party candidates) in the 2004 presidential election. Orange County was the only county with more than two cities on the list of the 25 most conservative cities: Orange (ranked 10, with 64% voting conservative), Garden Grove (17, 62%), and Huntington Beach (25, 61%). Other Orange County cities placed within the top: Fullerton (32, 59%), Anaheim (38, 59%), Costa Mesa (48, 57%),
all the more unusual for his extraordinary popularity among Irvine voters. Agran's national profile reached its zenith during his campaign for presidency in the 1992 Democratic Primaries. The *Columbia Journalism Review* published an article (Meyrowitz, 1992) criticizing Agran's cold reception by the national press and Democratic Party officials. The article highlighted Agran's leadership on environmental issues:

> as executive director of the Center for Innovative Diplomacy, he played a unique role as a “global mayor” who pursued issues of international trade, arms reduction, and human rights, and earned his city a United Nations award for his pioneering legislation to eliminate ozone-depleting compounds — all from an unlikely base in deeply conservative Orange County. (Meyrowitz, 1992; no pagination)

In an opinion piece he wrote for the *Los Angeles Times* only months before the base closure announcement, Agran called on local officials to develop an environmentally-sustainable, transportation-related reuse plan in the event El Toro be closed. He envisioned the facility would serve “as a 21st-Century hub for a revitalized network of Southern California rail service” (Agran, 1993). In response to Orange County voters' approval of airport reuse in 1994 and their subsequent rejection of Measure S in 1996, Agran founded and chaired Project '99 in 1996. This nonprofit activist organization formed to 1) review the legality of airport reuse plans, 2) study plans for employing John Wayne Airport at its full capacity, and 3) develop non-aviation reuse

---

Irvine, (68, 53%). Of the cities in Orange County with more than 100,000 residents, only Santa Ana (116, 45%) had fewer people vote for the conservative rather than liberal candidate in the 2004 election. W can compare these percentages with those of national electorate for 2004, in which George W. Bush won the election with 50.7% of the electorate (but only 44.4% of California's); John Kerry received 48.3% of the national vote (and 54.3% of Californian's).

55 Agran served as Irvine's first directly-elected mayor, as opposed to being chosen by the city council from among its members (Meyrowitz, 1992).

56 Though the media and party officials treated Agran as a so-called “fringe” candidate (the Democratic Party never invited him to participate in any of the debates, for example), he nevertheless succeeded in earning three votes at the Democratic National Convention that year, after receiving nearly 60,000 total votes throughout the primary season.

As the anti-airport campaign progressed, municipalities and organizations in the South County also began to oppose the supervisors' ever more ambitions plans for El Toro. Labor and professional organizations representing commercial airlines pilots, for instance, opposed El Toro at various stages throughout the planning process, mostly over concerns that the runway configuration and its proposed usage patterns could in some instances require pilots to perform potentially unsafe maneuvers — an episode I address in the second part of this chapter. For now, however, I would like to outline the political struggle over El Toro as manifested in campaigns for and against a series of ballot initiatives put before Orange County voters in 1994, 1996, 2000, and 2002 (see Figure 28, following page). Measure A, the first of these set the agenda against which all future airport opposition took shape. The subsequent ballot initiatives (S, F, and W) represented increasingly sophisticated strategies for ballot-box planning which eventually defeated the airport reuse plan.
Table 7

<table>
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<tr>
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</table>

*Later overturned after being declared unconstitutional by Los Angeles Superior Court.

Figure 28  Chronology of El Toro-related ballot measures

Ballot Measures

Measure A (1994)

In Spring 1994, Argyros and Marion Knott (of the Buena Vista themepark, Knott's Berry Farm) created the “Committee for 21,000 New Jobs” to fund a campaign for a pro-airport ballot initiative that would become Measure A (Martinez, 1994). In the November 1994 election, Orange County voters passed Ballot Measure A by a 51-49% margin,\(^57\) officially designating at least a portion of El Toro for use as “a publicly or privately owned and operated airport serving a substantial portion of the County's passenger and cargo air transportation needs” (Measure A, section 1.I.). The measure's passage also established a 13-member Citizens Aviation Advisory

\(^{57}\) For more election results, visit http://www.eltorairport.org/issues/votes.html.
Commission (CAAC), to plan the conversion of El Toro and report directly to the Orange County Board of Supervisors. The cities of Irvine and Lake Forest mounted an unsuccessful legal challenge to the results of the election, primarily on the grounds that the amended county general plan 1) barred Irvine from ever annexing El Toro and 2) denied Irvine's jurisdictional control over 300 acres of El Toro which resided within the city's boundaries. Along with the legal challenge, the cities of Irvine and Lake Forest also withdrew their participation from the CAAC. Following the election, the Board of Supervisors voted to 1) withdraw from the ETRPA by the end of the year, and 2) exclude Irvine and Lake Forest from direct participation in the reuse planning process (Reza, 1994b), positioning itself to be designated by the state- and federal government as LRA for El Toro (Reza, 1994a). After the votes, the Pentagon insisted that Orange County include Irvine and Lake Forest in the planning process (Lait, 1994; Reza, 1995) and continued recognizing the ETRPA as LRA. In Spring of the next year, however, the Pentagon designated the Board of Supervisors as official local reuse authority (LRA) for El Toro (Loar, 1995).

The LRA controversy illustrated the waning political power of the Orange County Board of Supervisors relative to its cities (Johnson and Martinez, 1993). The board asserted its jurisdictional right to El Toro in part because all but about 420 of the property's 4,738 acres remained unincorporated, leaving the bulk of El Toro subject to county land-use authority. If the county successfully gained control of this land, they would also be entitled to property taxes on any reuse development, airport or otherwise.

An episode from 1993 — only months following the closure announcement — presaged the supervisors' lockout of Irvine and Lake Forest from the planning process. Former Irvine mayor Sally Ann Sheridan explained the county's position on the base from the perspective of the cities:

“It turns out that they don't control much land-use designation anymore,” she said.
“This is an effort to keep their cash flow going at the county level. . . . The issue
now is who will control the base. That's much more important than what it will become. It's a classic struggle about who will decide things for the county.”

(Johnson and Martinez, 1993; no pagination)

Irvine and Lake Forest thereafter reconstituted the ETRPA as a coalition of anti-airport municipalities in the South County, including Dana Point, Laguna Niguel, Laguna Hills, Laguna Beach, and Mission Viejo. In 1997, acting as federally-appointed LRA, the Board of Supervisors assigned the ETRPA responsibility for developing a non-aviation alternative reuse plan for the airfield, which would serve as a backup plan in the event a “fatal flaw” was discovered in the primary airport reuse plan (Grad, 1997; Munoz and Grad, 1997). The ETRPA presented this plan, called the Millennium Plan, to the LRA in March 1998. This first iteration of the Millennium Plan focused on a variety of non-aviation uses for the site — mixed-use residential and commercial zones, office space, and recreational facilities — clustered around the edges of a sprawling park complex.  

The site and its planning have already been the subject of transportation related urban inquiry. An article in the *Journal of Urban Technology* (Page, Phillips, and Siembab, 2003) summarized the authors' proposal to the Orange County Council of Governments, which solicited ideas for “ways in which the county could absorb a projected one-half million additional residents and one-half million additional employees over the next twenty-five years” (64). The authors proposed that the Millennium City be developed according to their Network Oriented Development model, in which Orange County would shift “as many functions as possible from brick and mortar to a digital network. Once on the network, the functions could be made to appear at locations of strategic importance to transportation and economic development initiatives.”

The flexibility required of this terrestrially-based project has already been realized to one degree or another within passenger air traffic networks: innovations in aircraft design and route structures, for example, have enabled airlines to become more responsive to fluctuations in demand, providing better fits of aircraft capacity to levels of passenger demand along certain routes.

Following the schism, airport opponents secured enough signatures to secure a ballot initiative for the March 1996 election. Ballot Measure S would have overturned 1994's Measure A, thereby removing the airport zone designation from El Toro, disbanding the CAAC, and requiring any airport related reuse plans for El Toro to receive voter approval. The measure failed, 60% to 40%.\(^{59}\)

While the board prepared the airport system master plan (ASMP) for El Toro, opponents of the plan successfully introduced another ballot measure to Orange County voters. The March 2000 ballot included Measure F, designed to overturn Measure A by having voters ensure that “no act by the County of Orange to approve any new or expanded jail, hazardous waste landfill, or civilian airport project shall be valid and effective unless also subsequently ratified by a two-thirds vote of the voters voting at a County General Election.” With Measure A having passed by only 51-percent county voters and airport support waning generally during the subsequent six years, the passage and adoption of Measure F would require the pro-airport coalition to engage in an expensive and politically contentious (and likely-unwinnable) campaign for county votes. The three pro-airport supervisors had only two months before the March election negotiated an unconventional deal with representatives from regional labor organizations. On January 11th, 2000, the board voted 3-0 to approve a labor pact guaranteeing all major public works contracts for county-run projects employ 85% union labor. All county contracts related to the reuse of El Toro airport would be included under this agreement. The Democrats on the board both abstained; the three supervisors who voted in favor of the agreement were all pro-airport Republicans, “including a supervisor once targeted for recall by the Westminster firefighters union and another who campaigned to restrict political contributions made by organized labor”

\(^{59}\) For a city-by-city breakdown of Measure S, go to The El Toro Info Site's 'votes' page: http://www.eltoroairport.org/issues/votes.html.
(Willon, 2000). Following the agreement, local labor organizations lent their support to the campaign opposing Measure F.

Despite the new alliance between organized labor and the pro-airport coalition, Measure F passed by a large margin (67-percent to 33-percent). In December of the same year, however, Los Angeles County Superior Court Judge S. James Otero invalidated the initiative, upholding a challenge brought by the pro-airport Citizens for Jobs and the Economy. Otero struck down Measure F on the grounds that it contained “unconstitutionally vague” language, and violated a state law under which ballot measures could not apply to multiple, unrelated subjects (i.e., jails, airports and hazardous waste landfills). Most importantly, however, was the court's invalidation of the initiative on the grounds “that air transportation is a statewide concern.” Otero ruled that 1) because California state code permitted county boards of supervisors to “provide and maintain public airports” and 2) the Orange County Board of Supervisors secured airport-reuse authority via Measure A and approved a County General Plan, that 3) Measure F interferes with the board's authority. Otero further advised El Toro airport-reuse opponents that the only legal avenue available to them was to repeal Measure A and the county resolutions implementing it.

Measure W (2002)

During the year following their judicial defeat, the authors of Measure F continued developing a non-airport vision for El Toro. Without creating a clear alternative to the aviation reuse plans, the airport opposition had nothing of substance to offer voters. The ETRPA streamlined the Millennium Plan the board had approved as their official non-aviation reuse plan in 1998. Their updated plan would now need to appeal to a majority of an electorate that had grown increasingly skeptical of an airport than in previous years of the reuse struggle. Whereas

the previous iteration of the Millennium Plan devoted significant space to an economic development component, the plan that emerged in support of Measure W would convert the former airfield into an urban park “on a par with Golden Gate Park and The Presidio in San Francisco, Griffith Park in Los Angeles, and Balboa Park in San Diego” (Measure W). Unlike the voter-supported, court-invalided Measure F, Measure W contained language that, if accepted by Orange County voters, would enact the guidance given their cause by Judge Otero in his decision from 2000:

[Measure W amends] the General Plan of the County of Orange by repealing the aviation reuse designation for El Toro and other provisions enacted by Measure A in 1994; and replaces the aviation use designation with non-aviation designations to ensure that the property will become a multi-use center for education, park, recreation, cultural and other public-oriented uses. (Measure W, 1994; section 2.J.)

Passage of the measure would not automatically ensure El Toro's conversion to Orange County Great Park as detailed in ETRPA plan. Instead, its passage would rezone the site to allow for a range of (non-airport) land usage suggested by the plan, including parkland and open-space, as well as low-density development for cultural and recreational facilities, including universities, sports parks, botanical gardens, and wildlife corridors (Measure W, 2002).

Measure W proponents succeeded in introducing Measure W on the March 2002 Orange County ballot, where it passed with 58 percent of the vote. That election also signaled a shift in support for the airport among the Board of Supervisors. Chris Norby, a Fullerton City Councilman opposed to airport reuse, defeated pro-airport Chairwoman Cynthia P. Coad of the Board of Supervisors, who became the first incumbent supervisor since 1980 to lose a seat (Reyes, 2002). In the days following her electoral defeat, Chairwoman Coad agreed to drop support for the airport during the nine month balance of her term. Another member of the board's eroding 3-2 pro-airport majority, Supervisor Jim Silva, also announced plans to reverse his support of the airport should county voters pass Measure W (Pasco, 2002; Reyes, 2002). In the wake of the March 2002 election, for the first time in the more than seven-year struggle, a
majority of board supervisors opposed airport reuse. The following month, the Orange County Board of Supervisors voted to transfer planning and development responsibility of the El Toro site to the city of Irvine (Pasco and Reyes, 2002). Chairwoman Coad cast the deciding vote after securing promises for $2 million for developing parkland in the North County.

The Airport Working Group — with OCRAA, Citizens for Jobs and the Economy, and the city of Garden Grove — brought a legal challenge against the validity of Measure W, alleging that its authors had executed “a classic bait-and-switch” on Orange County voters by marketing a plan according to which the relatively undeveloped parkland would require no new county taxes. They alleged the project would likely entail, on the one hand, substantial support by Orange County taxpayers and, on the other, a significant residential and commercial development component: two outcomes explicitly rejected within the language of the initiative itself (Tom Naughton et al. v. Board of Supervisors for the County of Orange et al., 2002). The petitioners also contended that the measure unconstitutionally intruded upon the Orange County Board of Supervisors' status as state- and federally-designated authority (LRA) for El Toro, as well as invalidating local- and federal planning instruments related to El Toro reuse, including SCAG's federally-mandated Regional Aviation Plan (2001), the FAA Integrated Airport Systems plan, and the Orange County General Plan — all three of which integrated the proposed El Toro airport within projected regional air traffic patterns. This suit and at least two others were settled in 2004 without overturning Measure W (Yi, 2004).

Two days following voter approval of Measure W, the Department of the Navy announced their intent to sell the El Toro property in an auction to be held at a later date (Pasco et al., 2002). The use of the land after the sale would need to comply with the zoning requirements established by Measure W. In February 2005 Miami-based Lennar Corporation, the third-largest home builder in the United States, purchased the 3,718-acre El Toro tract outright for $649.5 million (Pasco, 2005). After the sale of El Toro, the issue of its aviation reuse came to an end.
Los Angeles Regionalization Strategies

Since the late-1970s, Los Angeles city-regional actors have sought to disperse air traffic demand throughout the region's airports. During the several campaigns for achieving air traffic decentralization, municipal governments have most often come together in one of among a handful of variations of a single instrument — a joint-powers authority — designed to achieve one of two concrete goals (or both): 1) the commissioning of new commercial passenger airports or the renovation of dormant facilities currently serving other purposes, and 2) the distribution of air traffic demand throughout underutilized facilities currently functioning as commercial passenger airports. A recurring failure of these efforts has been local governments' unwillingness to form joint-powers authorities imbued with legal powers strong enough to enforce measures that would achieve either of these air traffic regionalization strategies. Attempts by the various joint-powers authorities to grant such powers usually center on enacting organizational guidelines to prevent individual member communities from vetoing the decisions of the collective, coupled with powers granting the agency the legal authority to impose penalties on member communities which do not produce their “fair share” of aerial space.

The concept for a regional airports authority dates to a 1976 proposal by the Los Angeles Department of Airports (LADOA), then under the executive directorship of Clifton Moore. The authority proposed by Moore and LADOA would have been composed of regional airports whose voluntary participation in demand sharing would depend on the capacities of each facility involved (Erie et al., 2006; 33). The proposed authority failed to gain broader support from the city at the time, but in 1981 the city of Los Angeles, and the counties of Los Angeles, Riverside, and San Bernardino, formally agreed to resurrect the concept. Four years later, the parties signed a joint powers agreement, forming the Southern California Regional Airports Authority (SCRAA), which served during the next decade as a primary sponsor of regional airport planning and feasibility studies. Orange County joined the authority in 1991, but only after the other parties agreed that each member could veto any collective decision (Newton, 1991) — a
concession that effectively neutralized what little enforcement power the SCRAA had in the first place.

The intensity of the El Toro conflict threw the members of the SCRAA into irreconcilable discord for the duration of the reuse planning process, effectively dissolving the agreement. The SCRAA was reconstituted again in 2001, primarily in support of Los Angeles Mayor Antonio Villaraigosa's LAX modernization program (Oldham, 2002). Orange County withdrew from the authority in 2003, following Riverside's 2002 departure (Pasco, 2003). After the 2006 Los Angeles International Airport (LAX) Master Plan settlement, Mayor Villaraigosa reconstituted the SCRAA once again but the authority collapsed just two years later, after Orange and Riverside Counties declined to participate (Zahniser, 2008). The irreconcilable goals and disparate capacities of the various SCRAA members rendered the alliance unmotivated and unfit for engaging in the types of horizontally-organized collective action required to regionalize air traffic demand.

Assemblyman George Nakano, chair of the California State Assembly's Democratic Caucus, introduced a bill during the 2002 legislative session designed to exclude counties from federal and state transportation funding streams if they failed to provide airport capacity in

61 The LAX Master Plan Stipulated Settlement Los Angeles enabled LAWA to go ahead with major capital improvements to the south airfield. In 2006, Los Angeles Mayor Villaraigosa and the Los Angeles City Council settled multiple lawsuits filed against the most recent LAX Master Plan by the Los Angeles County Board of Supervisors, the Alliance for a Regional Solution to Airport Congestion (ARSAC), and the cities of Culver City, El Segundo and Inglewood.

Under the terms of the settlement, LAWA agreed to 1) scale back certain airport operations (with conditions) until 2020, 2) fund job training programs, noise abatement measures, traffic mitigation, air quality, environmental justice programs, and other quality-of-life improvements for communities neighboring LAX, 3) reconvene the SCRAA to plan for air traffic regionalization, 4) engage airport neighbors in future LAX plans and improvement projects. The settlement agreement is accessible via the LAWA website for LAX: http://www.ourlax.org/stakeholder/pdf/Signed_Stipulated_Settlement.pdf.
compliance with SCAG Regional Transportation Plan (RTP) forecasts (Pasco, 2002). Though Nakano did not directly target Orange County in the proposed draft of the bill, the approval of Measure W by Orange County voters (coming only weeks after the Nakano introduced the bill) would likely have rendered the county non-compliant under RTP air traffic forecasts. The bill, as amended throughout the summer of 2002, strengthened SCAG's regulatory and enforcement powers, requiring:

the aviation program within the SCAG regional transportation plan be developed in a manner that assures a fair-share distribution of both the burdens and benefits of commercial aviation among the four urbanized counties [and that] SCAG, in determining a county's fair share distribution, …assess the future passenger cargo demand that is reasonably attributable to each county. (AB 2333, 2002; no pagination)

The bill called on SCAG to conduct an annual review of plans and layouts for each of the region's commercial airports, making sure each maintained a capacity sufficient enough to comply with the RTP's passenger volume goals. The legislative process eventually blunted SCAG's enforcement powers, however. Instead of being able to exclude non-compliant counties from transportation funding, as Representative Nakano initially proposed, the amended bill merely prioritized these funding streams to RTP-compliant counties. Non-compliant counties would now be able to receive federal transportation funds; they would simply move to the back of the line.

The bill passed both the California State Assembly and Senate but California Governor Gray Davis vetoed the bill in September 2002, offering the legislature the following rationale:

I concur with the author that the potential adverse impacts of airport expansion require the consideration of regional strategies to decentralize aviation demand. This demand will likely be met by the expansion of existing commercial airports and the development of former military air bases. However, the term “fair share distribution” of commercial aviation burdens is not defined in this bill. As such, I am concerned [SCAG's] interpretation may be vulnerable to challenge by other regional participants.
While this bill is intended to bring about a more balanced distribution of the expected increase in aviation traffic, it also ignores the will of many Orange County residents. On two occasions the voters have rejected a new international airport at the former El Toro Marine Base. In addition, this bill imposes additional requirements upon [SCAG], resulting in a state mandated local program at a time when we must avoid the costs of expanded initiatives. (Davis, 2002)

In spite of the failure of this state-level attempt — and motivated partially by the ballot-box defeat of El Toro's airport reuse — Los Angeles city-regional officials continued investigating institutional arrangements to solve the problem of airports, airports, everywhere / nor any place to land (with humble apologies to Samuel Taylor Coleridge). In his most well-known poem, The Rime of the Ancient Mariner, Coleridge tells the story of the titular mariner, who shoots an albatross and, in accordance with maritime superstition, thus curses himself and the rest of the crew: the ship suddenly stops sailing and its crew soon grows parched. But they cannot drink any of the salt water in which they wallow. The substance the mariners most need exists in the right quantity but in the wrong quality. Following the resolution of the El Toro struggle, the Los Angeles region wallowed in an analogous situation. From the air, it seemed to have plenty of airport and runways. From the grounded vantage of its political actors, however, none of these facilities seemed to be in the right place, nor of sufficient length, nor free of any number of costly operational limitations.

In 2004, Los Angeles City Councilwoman Cindy Miscikowski — whose district at the time encompassed LAX and its surrounding communities — proposed the creation of a state-legislated regional airport authority. Unlike joint-powers authorities, Councilwoman Miscikowski's proposal would allow the State of California to grant a state-formed regional planning entity the power to enforce regionally-devised solutions to Southern California's congested airspace (Robinson, 2004). At the time of this proposal, it was still possible (though unlikely) for such an authority to overrule Orange County voter approval of Measure W, potentially putting El Toro back into play as a second county airport. After the sale of El Toro's
land in 2005, however, even that option became untenable. More realistically, a state-empowered regional airport authority would be able to convert into commercial airports a number of other recently transferred bases, including the Southern California Logistics facility (5,000-acres), March Global Port (4,500-acres), San Bernardino International (2,000-acres), and the dormant facility at Palmdale (17,750-acres).

After Orange County voters approved the anti-airport Measure F in 2000, Leland Wong of the Los Angeles Board of Airport Commissioners inquired into the legality of imposing a surcharge on Orange County residents who made use of LAX (Reyes, 2000). His proposal was found in violation of federal laws before it ever came to a vote. Seven years later, Walter Zifkin, also of the Los Angeles Board of Airport Commissioners, proposed a similar usage fee be imposed upon Orange County residents making use of LAX. Zifkin's proposal came in response to a 2006 LAWA study which found a 13-percent share of Orange County residents among a sample population of 28,000 LAX passengers (compared with a combined 9.3-percent from the other counties surrounding Los Angeles County). The economic rationale for the usage fee, if it ever became policy, was to charge Orange County for the spillover burdens associated with the increased air-passenger and cargo traffic imposed upon LAX and its surrounding residents as a result of both the capacity restrictions imposed upon John Wayne Airport operations as well as Orange County voters' inability to convert the El Toro property to commercial aviation use (Marroquin, 2007).

Throughout the El Toro reuse planning process, members of the pro-airport coalition frequently cited overreliance on LAX as a reason for commissioning a second Orange County airport at El Toro. One of the most attractive features of an airport at El Toro was the sheer size of its land area in comparison to the other airports in the region. The size of MCAS El Toro meant a commercial airport there could be more easily expanded or reconfigured to accommodate shifts in regional air traffic volumes. It also meant that El Toro would come equipped with a built-in buffer zone, helping to prevent noisy airport operations from disturbing
nearby residents. Based on these and other particularities of the site, the Orange County Board of Supervisors began submitting state- and federally-mandated environmental impact reports and airport plans to the relevant authorities (from about 1996 to 2000).

Coincident with this airport planning process, members of the anti-airport coalition began formulating oppositional strategies. While this oppositional campaign continued to emphasize classic NIMBY issues, including aircraft noise, roadway congestion, and air pollution — all primarily concerned with the quality of terrestrial space — they began to question the mechanisms by which the airport would produce aerial space. In the following section, I will address this in more detail but the El Toro opposition chiefly argued two points. First, they argued, the prevailing air traffic patterns proposed for El Toro by the board of supervisors carried departing planes along slightly-pitched runways and out towards the rugged Santa Ana Mountains. These two conditions — the pitch of the runways and the proximity of the mountains — may have been safe for more nimble military aircraft, but would likely prove either a) unsafe (though profitable) for use by fully-loaded, fully-fueled (i.e., long-range) passenger aircraft, or b) safe (though unprofitable) for use by half-loaded, lightly-fueled (i.e., short-range) passenger aircraft. In either case, they argued, the terrestrial position of El Toro within a rugged topographic surround would constrain air carrier operations in ways that of other regional airports would not. Second, they argued, the position of El Toro within a congested aerial surround would similarly affect its operational capacity. Integrating El Toro into the Southern California air traffic system — already one of the busiest in the world — might succeed in distributing air traffic throughout the region, but it would also add to the workload of those who manage the system. The air traffic patterns originally proposed by the board of supervisors created conflicts between El Toro-related aircraft operations and those of LAX, Long Beach, and John Wayne Airports. The density of aircraft operations to the north of El Toro would likely require regional air traffic managers to design and maintain a queue for arrivals and departures, whose effects might ripple throughout the national air traffic system, leading to corresponding
delays as far away as Dallas. Thus, while airport proponents began the lengthy effort to obtain state- and federal- approval for airport plans that were only becoming more rigid, their opponents turned these plans against them, making the case that El Toro would make a good fit for neither the terrestrial- nor aerial-spatiality of the Los Angeles city-region. In the following section, I describe how airport opponents leveraged El Toro's position within terrestrial and aerial networks to sow doubts regarding its fitness as a major commercial passenger airport.

**Calling Attention to the Materiality of Aerial-Spatial Production**

In the previous chapter, I summarized the protracted political wranglings between pro- and anti-airport groups as it took place primarily within the legal and policy arena — coming, as it did, in the form of plans, counterplans, and numerous ballot measures challenging the voter-approved, pro-airport Measure A, in 1994. The political struggle over El Toro divided Orange County into oppositional geographies demarcated primarily according to how they related to current and proposed forms of aerial-spatial production. The campaign opposing airport reuse, for example, traded upon (and helped foment) South County residents' anxieties over increased airport-related noise, pollution and traffic. The campaign supporting the airport similarly stoked North County aspirations for direct connections to global markets, particularly the economic benefits such connections might entail for Orange County's tourism industry and high-tech firms. These aerial-focused anxieties and aspirations in turn fed back into how the county's residents — whether north or south, pro- or anti-airport — envisioned their everyday, terrestrially-grounded lives. There are no future visions of an urban terrestriality which do not already incorporate a corresponding aeriality. They become mutually enfolded.

In 1996, during the anti-airport coalition's Measure S campaign (for overturning Measure A), the Board of Supervisors (at this point, acting as the LRA for El Toro) submitted a Community Reuse Plan to the Department of Defense. The plan, as approved by the DOD, called for the redevelopment of El Toro as a commercial airport, with some land set aside for non-
aviation purposes, including a 1,000 acre nature preserve and space for commercial, educational, and office facilities.62

Five years later, after the completion of environmental impact studies and coordination with the FAA and various regulatory agencies at multiple scales of governance, the Board of Supervisors finally submitted its Airport System Master Plan (ASMP) to the federal government. This ASMP contained their EIRs, FAA-mandated airport planning documents, and financial documents outlining how the federal government would transfer the El Toro property and title to the LRA. The board approved and submitted this plan on October 23, 2001, only a little over a month after the horrific events of September 11, 2001. Initially conceived during an era of expansion and growth for the airlines and related industries, the airport-reuse plan finally came of age during a period of declining consumer demand for air travel and increasing federal demand for airport security.

The failure of the El Toro airport-reuse plan, however, stems in large part from its authors' conceptualizations of the proposed airport as merely a site reliant upon, and also productive of, a continuously-enacted set of political-economic relationships. From the outset, the pro-airport coalition primarily framed the airport as necessary to the fitness of the region within (terrestrial) political-economic systems, including the tourist industry centered on Orange County and the regional alliances to better distribute air traffic, both across the broader region as well as across Orange County itself (i.e., away from John Wayne Airport). But the authors of the aviation reuse plan did little during the planning process to address the proposed airport's physical-ecological relationships. Airport proponents failed to illustrate how commercial airport operations at El Toro would safely and efficiently integrate within both the immediate

62 The plan also called for “a 1,000-acre habitat preserve, and aviation-compatible institutional, educational, and commercial/office uses on the El Toro property” (Community Reuse Plan, 1996).
topographical surround, as well as the dense air traffic networks over the surrounding region of Southern California.

We can group the different proponent groups according to three distinct set of needs related to improving the quality of their terrestrial dwelling. The first group included residents of Newport Beach and other communities around John Wayne Airport. In addition to achieving limits on JWA operations, the most vocal elements of this group had long petitioned the board of supervisors to more evenly apportion Orange County air traffic among several potential commercial airport sites within the county. The second group included business and municipal leaders from North County communities, who framed airport reuse as a necessary infrastructural investment. These actors envisioned El Toro as a platform that would enable Orange County's high-technology and tourism-driven industrial base to develop direct relationships with distant markets (and, more to the point, to do so without relying upon LAX). The third group included residents and officials of the City of Los Angeles, who had for decades pursued strategies for distributing air traffic throughout the region's dense system of secondary airports. These efforts were largely disorganized, however, and failed to achieve any consistent or long-term change to regional air traffic operations. This group claimed that, by distributing some of its short-haul service to other airports, LAX might free up space under its legally-imposed passenger caps—and that it could do so without the need for otherwise expanding operations. This distribution of air traffic might then allow the airport to better satisfy demand among regional passengers for more specialized service to long-haul domestic and international markets (LAWA, 2000). The competitive advantage LAX enjoyed within international markets had gradually eroded over the previous several of decades as aerospalal innovations (e.g., bigger planes using more efficient engines) improved the ability of more remote, more capacious inland airports (such as those in Denver and Dallas) to compete for long-haul international traffic. The sheer size of El Toro's 4,700 acres relative to 500-acre John Wayne Airport and other secondary facilities in the region would enable the proposed airport to more effectively supplement short-haul service at LAX,
while also satisfying demand for longer-haul, domestic service for the Orange County and San Diego markets (LAWA, 2000; 34-35, 46-47). In response to these proponent arguments and concerns, Irvine-based opponents of local- or state-led efforts to regionalize Los Angeles air traffic via El Toro initially offered classic NIMBY arguments, primarily calling attention to the negative effects an airport might have on the terrestrially-grounded lives of area residents, including air and noise pollution, as well as roadway congestion.

As the El Toro reuse process wore on, however, the anti-airport coalition began developing more sophisticated oppositional strategies, which pointed towards the materiality of air, the physics of flight, and the practical governance of aircraft interactions within aerial space. The following section addresses two modes of resistance in this vein, defined according to the focus for each. In the first, opposition actors emphasized shortcomings in the configuration of the airport itself. The discussion covering this mode of resistance cites claims by airport opponents that the runway configuration for El Toro, as well as its intended usage patterns, rendered the airport unfit for jet airlines, whose functional capacities (e.g., thrust to weight ratio) and imposed limitations (e.g., passenger-friendly climb rates) differ significantly from the military aircraft the runways were originally designed to accommodate. According to the second mode of resistance, opposition actors claimed that the proliferation of airports in the Los Angeles city-region — though able to distribute the regional load more evenly across terrestrial space — would actually increase the complexity of city-regional airspace, increasing the workloads of air traffic controllers and therefore the risk of aircraft collisions.

**Runway Configuration**

El Toro consists of two sets of parallel runways crossing at a right angle (see Figure 29, following page). When seen from above, the crossing runways resemble a compass rose on a map — the symbol for identifying cardinal directions — replete with one runway pair pointing (more or less) north-south and the other (more or less) east-west. Per the conventions of air
traffic management, each of El Toro's runways bears a number designation roughly equivalent to one-tenth the angle of its direction, or azimuth, from magnetic north, or 360°. According to this convention, a runway oriented towards 340° (i.e., 20° west of magnetic north) would be designated 34.

Figure 29  MCAS El Toro runway names
During most of the reuse planning process, El Toro's east-west runways bore the designators 7L/25R and 7R/25L, while its north-south runways bore 16L/34R and 16R/34L. The gradual and constant flux of the Earth's magnetic field requires periodic adjustments to runway numbers and related navigational aids (e.g., maps, charts, and safety reports); some documents related to El Toro include runway numbers updated in this manner. Each of these runways presented a special set of issues for departures, which the Orange County planners had to consider. Departure patterns along southbound runway 16 or westbound runway 25, for instance, remained free of rugged terrain and prevailing tailwinds but placed aircraft in low-level flight over urbanized areas, including densely populated residential areas to the west. Pro-airport planners dismissed both of these departure paths early in the process. Permitting aircraft to arrive and depart over these noise sensitive areas would have rendered aviation reuse for El Toro politically untenable. Moreover, the cost to the county of noise abatement in these areas would have crippled a community reuse plan marketed by the county and the pro-airport coalition for its ability to generate municipal revenue. The following section considers the fitness of these runways within the surrounding topographical, sociopolitical, and aerial landscapes (or airscapes), with a concluding analysis of the planning and political missteps which led to the proposed Orange County Airport's eventual exit from the Los Angeles city-regional airport system.

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63 To distinguish between runways in a pair, air traffic management uses the additional designators 'L' or 'R,' for 'left' and 'right.' Thus, if our aircraft touches down on runway 34L, we are now on the leftmost runway of a pair pointing in the direction of 340°. If we depart runway 34L in the opposite direction (a mirrored, 180° reflection), we would now refer to it as runway 16R (because 340° turned 180° becomes 160°). In most contexts, we refer to this runway as 16R/34L. But pilots and air traffic controllers most often refer to runways according to whichever of the two possible numbers appropriately describes the direction of its intended use. Therefore, assuming runway 16R/34L is the only arrival runway in current operation at El Toro, an air traffic controller might direct northbound planes to runway 34L and southbound planes to 16R. Since we will not be landing on these runways anytime soon, we can safely refer to them here without the 'L' and 'R' designators.
Loma Ridge and the Santa Anas

From the beginning, therefore, planners designated northbound runway 34 or eastbound runway 7 to serve as the airport's primary departure runway, with the other designated as secondary departure runway. In the case of runway 34, aircraft would have departed in the direction of Loma Ridge, which rises almost 800-feet only three-miles to the north of El Toro and reaches an elevation of 1,000-feet another mile beyond. This had posed a major safety concern for El Toro's previous Marine Corps tenants. In June 1965, a Vietnam-bound C-135A Stratolifter military transport aircraft carrying 71 Marines and 12 Air Force crew-members crashed into Loma Ridge after departing El Toro from runway 34. At the time, it was the most deadly aircraft disaster in California history. In the wake of the tragedy, the Marine Corps altered departure procedures to prohibit heavy transport aircraft from takeoffs on runway 34. Northerly departures were compounded further by aircraft operations involving LAX to the northwest and John Wayne Airport to the west, whose arrivals and departures formed a dense tangle of flight paths along an east-west axis to the north of El Toro. I address this issue in the next section.

As for easterly departures, aircraft using runway 7 faced terrain features which, though more distant from the airfield, rose to a greater elevation than Loma Ridge. The Santa Ana Mountains rise to an elevation of 5,500-feet nine-miles to the east of El Toro, itself only 400 feet above sea level. Moreover, prevailing tailwinds to the east make it difficult for aircraft to achieve lift. Pilots prefer to takeoff into a headwind, which works in synergy with engine thrust to “push” air over and under the surfaces of the wing, allowing the aircraft to generate lift more efficiently than in a tailwind.

The Orange County Board of Supervisors released an early public draft of their MCAS El Toro Community Reuse Plan in August 1996 as they began preparing an initial environmental impact report (EIR). Under their preferred runway configuration, called Alternative A, the county proposed nearly 70% of departures would take place using runway 7. The board of supervisors requested comment on this proposal from various aviation-related organizations,
including the Air Line Pilots Association (ALPA), the largest AFL-CIO chartered pilot union in North America (at 50,000 members). In a response letter (1996), ALPA strongly supported moving the bulk of Orange County air traffic away from operationally-constrained John Wayne Airport but stopped short of endorsing the board of supervisor's Alternative A, dismissing it primarily for its reliance on runway 7 departures. The letter expressed the organization's concerns over prevailing tailwinds and the slope gradient of runway 7, as well as its length and heading.

ALPA also cited county planners' omission of key information within the runway length analysis component of the draft Community Reuse Plan. The pro-airport coalition claimed El Toro operations would benefit the regional economy by, for instance, attracting a range of airlines who would be able to make more efficient (and thus profitable) use of Orange County air travel demand than is enabled by John Wayne Airport, which prohibits the operation of aircraft larger than the Boeing 757. But the relatively short length of runway 7 precluded its use by fully-loaded, fully-fueled aircraft in common use by major domestic carriers. For example, the best-selling aircraft in the world, the Boeing 737-300/400/500, would be unable to safely depart from runway 7 carrying both a full passenger load and fuel enough for non-stop flight to several major hub facilities, including those at Chicago and Dallas (adapted from range and maximum takeoff weight information provided by Boeing, 2005). A 737-300/400/500 series aircraft requires a runway of at least 7,550-feet in length when empty (adapted from takeoff field specifications provided by Boeing, 2005). The 8,000-feet of runway at El Toro, coupled with prevailing tailwinds, would require carriers to compromise by decreasing either fuel loads (meaning shorter, less profitable trips) or passenger loads (meaning less profitable use of cabin capacity) when using aircraft such as the 737 or MD80.

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64 Aircraft larger than the Boeing 757 include commonly-used wide-body aircraft such as the Boeing 777 and Airbus A340, as well as 'jumbo jets' such as the Boeing 747 and Airbus A380.
The draft report suggested that the significantly higher-powered engines of the Boeing 757, however, would be able to safely depart eastwards from El Toro's runway 7. ALPA challenges the assumptions behind this, stating that county planners based their claim on calculations of a Boeing 757-200 using the more powerful Rolls Royce engines (86,000 pounds of thrust) versus the more commonly-employed Pratt and Whitney engines (75,000 pounds of thrust). Of the four largest domestic carriers at the time, only American used 757-200s with Rolls Royce engines; United, Delta, and Northwest Airlines all used the less-powerful Pratt and Whitney versions:

The significance of these facts is that, instead of assessing the safety of aircraft takeoffs to the east with less powerful engines, a less conservative assessment has been made using the more powerful aircraft, which skews the results away from day-to-day reality. (Russell, 1996; no pagination).

While not wholly precluding 757 operations from the runway, the miscalculation provided another leverage point for the anti-airport coalition's broad assault on the airport plan. This discussion of runway lengths highlights the fitness — or lack thereof — between El Toro and the network strategies of air carriers, as well as the departure capabilities of the aircraft these strategies employ. Mandated departures away from noise sensitive areas — and towards mountainous terrain — meant the airlines compromised profitability, either by flying shorter routes, fewer people, or different aircraft.

The ALPA letter also expressed pilots' concerns over the gradient, or slope, of the primary departure runway, which fell outside FAA guidelines for safe departure operations. In their 1996 letter, the organization claimed that the runway exceeded the FAA-mandated 1.5-percent slope maximum, potentially leading to aircraft overrunning runway 7. In the case of prevailing tailwinds, the short runway became an even greater risk factor. In a subsequent EIR (1999), the county again proposed runway 7 as the primary departure runway. In its response to this EIR, ALPA reiterated its concerns over runway configuration, length, and slope gradient.
The Allied Pilots Association (APA), the largest independent airline pilots union in the world (at 10,000 members), detailed the EIR's “many hazardous restrictions that force air operations unacceptably close to the limits of aircraft performance,” including departure operations that in many instances required pilots to take off on a runway sloped 1.5% — just within the 2% acceptable limit — and into a decelerative, prevailing tailwind (Darrah, 2001; no pagination). The county submitted an Airport Layout Plan (ALP) to the FAA in 1999 as part of its final EIR. In the ALP, the county proposed reconstructing primary departure runways 7L and 7R to have a slope gradient of less than 1-percent — well within FAA guidelines (Simmons and Withycombe, 2001).

In addition to specific concerns over the inability of runway 7 to allow safe departures towards mountainous terrain to the north and east of El Toro, ALPA recommended significant changes to the proposed airport's runway configurations (1996, 1998). The most comprehensive of these recommendations came in ALPA's response to the county-drafted Terminal Instrument Procedures report (TERPS), an FAA-mandated document establishing safe aerial pathways for arriving and departing aircraft. This is the first planning document in which county planners offered a detailed assessment of the issues and obstacles particular to the proposed airport, as well as fine-grained procedures for addressing or avoiding these (for instance, dictating minimum altitudes or turns to avoid particular terrain features). ALPA recommended two alternatives to the proposed county plan, both stemming from safety concerns over large passenger aircraft whose avoidance of noise sensitive areas would require they depart towards the hazardous terrain of Loma Ridge or the Santa Ana Mountains. Both alternatives would require the county to demolish El Toro's current runways and construct new ones within its footprint — each a costly and time-consuming measure that, if adopted, would threaten to derail the EIR and airport planning process. ALPA's preferred alternative called for the county to construct parallel runways along azimuths 130°/310° (i.e., runways 13/31) to replace El Toro's crossing sets of parallel-runways. The secondary option called for the removal of parallel
runways 7/25 and the construction of a third runway, oriented southwest-northeast (13/31) to go along with the two extant runways 16/34. In the letter, ALPA supports the “concept of moving air carrier operations out of John Wayne Airport due to its undesirable margins of safety” but only on the condition that Orange County revise the runway configuration, either wholesale (using their preferred recommendation) or in part (using the second option; Russell, 1998).

The position of El Toro within the spatial and political landscapes of the Los Angeles city-region provided pro-airport planners with little option but to choose the most politically expedient runway options over those offering the safest aircraft operations. The ambitious, high-capacity airport proposed by the county lengthened the planning process, allowing time for the anti-airport coalition to incorporate into its campaign a handful of strategies which called attention to the fitness of the proposed El Toro Airport as a platform for safe arrivals and departures. In the early stages of the planning process, the Irvine-led opponents to airport reuse had largely focused on how the airport might negatively affect everyday life on the earth's surface (e.g., noise and particulate pollution from aircraft and surface traffic congestion). In the final stages, the anti-airport coalition produced a ten-minute informational video presenting many of the objections raised by pilots and union representatives in their responses to county plans at various stages of the planning process.  

The Trouble with Managing Airspace

In addition to illustrating the mismatch between El Toro's terrestrial configuration and its ability to safely and profitably produce aerial space, the anti-airport campaign also directed public attention to the inefficiencies El Toro would create for the maintenance and governance of Los Angeles city-regional aerial space. Specifically, the coalition publicized FAA-sponsored analyses and other official accounts documenting the increasing aerial complexity which would

attend the commissioning of a nearly 29 MAP airport in the vicinity of significant air traffic flows involving LAX, LA/Ontario, Long Beach, and John Wayne airports.

Though a greater number of airports would indeed help achieve a more even distribution of air traffic among regional airports, it would also add to the complexity of the overall system, increasing delays and adding to the workload of controllers at Southern California TRACON, the FAA's central air traffic control facility for the region (Gold and Pascoe, 2000). In late 2000, the FAA initiated a study on the current and projected usage patterns of Southern California airspace, including proposed operations at El Toro. SCAG requested the study as one of several inputs for their Regional Transportation Plan, which required FAA forecasts of Southern California air traffic and its proposed management structure (Larsen, 2000). In January 2001, an inspector from the FAA used a Learjet 60 to conduct a preliminary evaluation of El Toro facilities and departure routes, checking for obstacles and other impediments to safe arrival and departure (Reyes and Morin, 2001). The FAA completed their forecasts and analysis of Southern California airspace in mid-2001.

In their report (2001), the FAA reviewed the LRA's proposed airport layout plan (ALP) and preliminary flight procedures provided by the county in the TERPS plan, finding both met minimum standards. Their full review also included an “examination of the effect of surrounding terrain on aircraft operations and the complexity of existing air traffic control operations and procedures in the area” (14). Based on this analysis the FAA “concluded that aircraft operations can be performed safely, however it would not be the most efficient use of navigable airspace within the National Airspace System” (17).66 The agency based the claims on their analysis of El

66 The FAA mission statement, usually given its own page within the front-matter of agency publications, is “To provide the safest, most efficient aerospace system in the world.”
Toro's arrival and departure operations conducted by federally-contracted engineering research firm MITRE Corp (Simmons, 2001), which found:

The secondary departure runway, runway 35 [operations to the north] ... seems to require the use of constricted airspace. While 35 is the secondary departure runway, factors such as wind or aircraft climb performance may require its frequent use, especially in light of the type of operations forecasted in the Airport Master Plan. In order to accommodate runway 35 departures, SCT [the regional air traffic control, or ATC, covering Southern California] must meter SNA and LGB arrival flows north of ELB which currently use the airspace, or hold the ELB departure on the ground until a gap is created in the SNA/LGB arrival stream. In either case, delay would result from ATC’s need to maintain safe separation in the constrained airspace of Southern California. (9; emphasis added)

The report makes clear that, though commercial aircraft were able to safely use El Toro, the proposed additions to regional air traffic would come at the expense of overall system efficiency, chiefly by increasing “the workload of controllers in the Coast Area” (9). The “controllers”

67 The full (and unwieldy) title: Analysis of Revised Arrival and Departure Procedures for Proposed Civil Aviation Reuse of the Former Marine Corps Air Station El Toro Orange County, California.

68 A draft of this MITRE-authored document (2000) acquired by the ETRPA offers a more unrestrained analysis of El Toro, using its previous airport code (NZJ) and former runway designators (34 and 7):

There is no immediate obstacle to runway 34 arrivals at NZJ. Likewise, runway departures are feasible in the current system, as far as this level of modeling can ascertain. The secondary departure runway, runway 34, however, seems to require the use of airspace that is not available in the given configuration of the SCT.

Departures from some other runway than 7 appear to be necessary for the operation of NZJ as a civilian airport. First is the question of noise, which led to the designation of 34 as a secondary departure runway. More important however, is that the Master Plan foresees NZJ as serving long-distance traffic. This implies that there will be heavily-loaded aircraft departing NZJ in some situations. Heavily-loaded aircraft, especially on hot days, may not be able to climb at a rate sufficient for runway 7 departures. Some means of accommodating them will be necessary. This may be a redesigned departure procedure from 34, or perhaps the use of some other runway.
referred here are those operating out of the Terminal Radar Approach Control (TRACON) for Southern California, often called SCT (as it is in the MITRE Corp-authored report cited above). These TRACON controllers work from a standalone facility in San Diego, which provides air traffic approach control to aircraft arriving or departing from 62 airports spread over 15,000 square miles of the Southern California region, from Burbank in the north to the Mexican border in the south. This sector encompasses all major commercial and general aviation airports in the Los Angeles and San Diego city-regions.

Jurisdictionally, TRACONs are administrative units within the federally-managed national airspace system. Each TRACON manages aircraft arrivals and departures within a designated sector of a still-larger volume of airspace; each of these larger units are in turn managed by Air Route Traffic Control Centers (ARTCC, or simply Centers). The United States system consists of 21 ARTCCs; these are subdivided into about 185 TRACONs total. Functionally, whereas ARTCCs control aircraft operating at high-altitudes en-route through a designated volume of airspace, TRACONs manage aircraft transitions between en-route control by ARTCC and control by a particular airport's air traffic control tower (ATCT). In the case of single airport regions, TRACONs may be located in the control tower of the airport itself. In most cases, however, TRACONs consolidate control for several airports throughout a metropolitan area and usually occupy standalone, specially-equipped facilities, such as SCT.

The size of its coverage sector and the density of airports within Southern California both go towards making SCT the busiest such facility in the United States (followed by New York TRACON and Potomac Consolidated TRACON; FAA, 2011; 13). SCT handled nearly two million aircraft operations in 2011: more than the combined operations of Miami (ranked ninth) and Denver (ranked tenth) — or more than the aggregate total for the Phoenix, Philadelphia, and Charlotte TRACONs (ranked twelfth, thirteenth, and fourteenth). In another examination of the effects El Toro might have on Southern California airspace, the FAA analyzed the LRA-proposed 156 aircraft operations per day, concluding that “the LRA re-use plan would increase
airspace congestion by approximately 10%,” requiring the FAA and TRACON to enact safety-measures for offsetting the increasing complexity, which would in turn lead to “reduced sector capacity and increased delays for aircraft already in the airspace” (FAA, 2001; no pagination). An earlier FAA memorandum (1996) provided the first publicly-available documentation of the agency's doubts regarding the efficiency of adding El Toro air traffic to the SCT workload. Specifically, this memorandum highlights the potential conflicts arising from El Toro's proximity to John Wayne Airport:

Two airports within seven nautical miles poses significant problems for air traffic. Overlapping airspace boundaries, crossing instrument approach and departure procedures and insufficient airspace capacity [...] would surely result in gross inefficiencies at both airports and would serve no useful purpose to the National Airspace System. The only viable solution to the problems would be the application of a “turn-key” type operation, wherein the existing John Wayne Airport would close when the MCAS El Toro Airport opens. Without this commitment from Orange County, we would surely be looking at major traffic conflicts [sic], delays and inefficient use of airspace and other resources for many years to come. (Williams, 1996; no pagination)

Thus, early in the planning process, the FAA advocated “turn key” operations for the airports as “the only viable solution” for avoiding the “gross inefficiencies” of concurrent, conflicting air traffic operations. In subsequent public documents, officials from both American (1998) and United (1998) Airlines unequivocally supported the closure of one or the other airport, precluding the usage of both by either major airline, thereby tacitly condemning the FAA's “turn-key” proposal. In a letter to the editor of the El Toro Info website, American Airlines Executive Vice President of Operations Robert W. Baker stated very clearly that, “American could not support operations from both locations” (1998). Larry Clark, a Vice President at United Airlines, made a similarly blunt statement in a letter (1998) addressed to Orange County aviation planners:

United is opposed to a two airport system. They dilute operating efficiency, substantially increase operating costs and could result in less service to the community.
The 1996 FAA memorandum further suggests that, assuming Orange County did indeed adopt 'turn-key' operations, the crossing runways configuration of the El Toro site would likely require the county to reconfigure the site to include “independent parallel runways to maximize the efficiency and capacity of the airport surface and the surrounding airspace” — an expensive undertaking which “the topography of the site may very well make...impractical” (Williams, 1996; no pagination).

In June 2000, OCRAA Executive Director and Newport Beach Assistant City Manager Peggy Ducey released a memorandum to the OCRAA Board of Directors. The document is presented as a hypothetical press release from the future (more precisely, the year 2007), in which Ducey describes her vision of Irvine International Airport, located on the former site of MCAS El Toro. The facility and its surrounding complex has become the “World Port Orange County intermodal transportation center” (Ducey, 2000; see appendix for full memorandum). Rechargeable fuel cell vehicles are available for rent by the hour. The runways are constructed and configured according to “revolutionary” technologies. Arrivals and departures are controlled by “super high tech air traffic management systems.” The site boasts, among other amenities, a “Cybertainment Center” and “pan-ethnic food bazaar brimming with exotic retail, cultural and educational activities.” She asks us to notice:

how quiet the landscape remains in spite of the extensive transportation activities that are in operation. As a consequence of extraordinary new technologies and out of respect for the surrounding communities, World Port reflects a new attitude toward what transportation can and should be. (Ducey, 2000)

Without calling attention to the sunny optimism of Ducey's vision of 2007 we can nevertheless remark on both the spatial myopia of her vision, as well as its unmitigated flatness.69 Throughout the memorandum, she describes the facility only in reference to the amenities available within its confines. Aside from her mention of “a carefully selected array of aircraft that includes Stage IV

69 This future vision is mere platitude in its most literal sense, the word deriving from the Old French word plat, meaning “flat.”
jets and the latest in the smaller 70-passenger regional jets used for shuttling passengers to larger international hubs,” Ducey fails to illustrate precisely how the intermodal transportation center would relate with distant city-regions, or otherwise integrate into its surrounding city-regional context. As with much of the El Toro reuse planning process, the authors of the airport proposal neglected to articulate — if not consider — the materiality of aerial space and its production.

Conclusion

The ballot-box planning process designated El Toro first for reuse as an airport, then as virtually anything but an airport, then again as an airport, before finally settling on its reuse as a multiuse park complex. At the level of regional political-economic relations, this process pitted a coalition of John Wayne Airport neighbors and North County business interests against relatively-affluent South County residents, centered on Irvine. We can attribute the South County-based anti-airport coalition's victory to a mix of causes, both endogenous (e.g., Orange County's emergence from bankruptcy and an attendant lack of economic desperation, the departure of lead airport proponent George Argyros, and the proximity of John Wayne Airport) and exogenous (e.g., the airborne atrocities of September 11, 2001, and the resultant collapse of public confidence in air travel and airport security). But most damaging of all to airport proponents was, on the one hand, the massive spatial and economic scale of their proposed Orange County Airport and, on the other hand, the amount of time the unwieldy airport planning process allowed for its well-funded, politically-savvy opponents to eventually craft a compelling alternative to the airport. Both of these — the scale of the airport plans and the time of the planning process — also opened airport proponents to the opposition's broad political assault on both the terrestrial and aerial fitness of the planned airport as a relational, infrastructural facility.

El Toro proponents can therefore blame the failure of their cause in part to a planning (and political) miscalculation. Their reuse plan called for an airport whose planned passenger volumes (of 28.8 MAP) would have made it one of the 30 busiest airports in the world in the
year 2000 (Airports Council International, 2012): larger than the major international airports serving Boston and Seattle, and slightly smaller than the international airports of Toronto and Singapore. The ambition of this plan may have seemed prudent during the early stages, when county planners needed most of all to stimulate a flagging local economy driven by tourism and high-technology manufacture — two industries which thrive on low-cost access to distant markets. Nearly a year prior to 9/11, however, chief airport supporter George Argyros began publicly criticizing the scale of the planned El Toro airport, suggesting that many Orange County voters viewed the proposed facility as “an unnecessary burden” (Pasco, 2000). Coming off 2000 — a year of record revenue for the airline industry — the recession that began 2001 had already begun to diminish air travel demand by the time 9/11 led to the virtual collapse of the entire airline industry.

Immediately following 9/11, airlines cut their labor force and other operating costs, resulting in a nearly 20-percent reduction in total airline capacity (Zuckerman, 2001). Midway Airlines, already operating under the protection of bankruptcy court, suspended its operations entirely on September 12, 2001; it began operations again in December of that year, only after reorganizing as a much smaller airline (Maynard, 2001; Isidore, 2001). Intensified passenger screening negatively impacted business air travel in particular, as business travelers often chose to avoid the inconvenience of long lines and delays at airports by teleconferencing or using other modes of travel (Belobaba et al., 2009; 6). US passenger traffic declined by almost 6-percent from 2000-2001, and another 1.4-percent in 2002; it marked the first time since the Second World War that domestic airline capacity contracted for two consecutive years (IATA, 2011). The collapse in demand for air travel — and of public confidence in the airline industry itself — happened to coincide with the dueling campaigns in the run-up to the March 2002 Orange County ballot measure. After nearly a decade of costly planning and politicking, the outcome of Measure W would ultimately determine El Toro's fate. It is altogether unclear how the vote would have gone without the disastrous effects of 9/11. What is clear, however, is that an El
Toro reuse plan calling for smaller-scale, community-minded airport operations (such as those permitted at John Wayne Airport) may have better enabled the pro-airport campaign to make the more politically tenable “fair share” case that Southern California regionalization proponents had been making since the 1970s.

As outlined in previous sections, the anti-airport coalition had time enough, and resources, to craft a wide range of strategies for resisting aviation reuse, including those strategies which leveraged the expertise of actors involved in the routine production of aerial space: pilots and aerial administrators. By representing the proposed airport as “an unnecessary burden” not only upon the adjacent terrestrial dwelling practices and economy of Orange County but also upon the aerial dwelling practices and economies at multiple scales of governance, airport opponents gave El Toro aviation reuse proponents little room to maneuver. The pro-airport campaign was in the unenviable position of marketing the proposed Orange County Airport as capable of delivering, on one hand, significant positive impacts upon local and regional economies, and, on the other, insignificant impacts on local and regional environments.
Chapter 6

CONCLUSION

Architecture, suggests Langer, is an *ethnic domain*—“a physically present human environment that expresses the characteristic rhythmic functional patterns which constitute a culture.” In other words, the shaping of space which goes on in architecture and, therefore, in the city is symbolic of our culture, symbolic of the existing social order, symbolic of our aspirations, our needs, and our fears. If, therefore, we are to evaluate the spatial form of the city, we must, somehow or other, understand its creative meaning as well as its mere physical dimensions. … It is important that we understand these interactions if we are not … “to reconstruct the preconceived city forms that matched the social structures of past eras”. The basic point I am trying to make is that, if we are to understand spatial form, we must first enquire into the symbolic qualities of that form.

— David Harvey (1973; 31-32)

Introduction

Urban policy research and analysis has traditionally conceptualized cities as jurisdictionally-defined, terrestrial units. Throughout the twentieth century, however, authors invested in sociospatial research more generally have developed vocabularies for better describing everyday objects and places as relationally constructed. These approaches have emerged within cross-disciplinary urban research — including urban policy and analysis — as primary methods for understanding and critiquing the institutional actors who govern the relationally-constructed city. This dissertation flows from this strand of urban policy research and analysis. It contributes to a reconceptualization of the terrestrial-aerial relationship, and an identification of the aerial dimensions of the Los Angeles city-region. The dissertation allows us to analyze the evolution of, and future trajectories of, the city in relation to its immediate regional surround, as well as to those other city-regions within its air traffic network, either as
hubs in the Western United States, or as gateways linking domestic networks with international. Perhaps more importantly, however, the empirical and conceptual work behind this dissertation points to a need to notice, understand, and apply our knowledge of aeriality within the domain of city-regional planning and policymaking. Extant conceptualizations which relate urban processes with the atmosphere are inadequate for evaluating the extent to which aerial space and its production plays a significant political, economic, and environmental role in the internal development of cities, and not merely to their external relations.

In her 1931 essay, “The Docks of London,” Virginia Woolf weaves a spatial narrative which relates the needs and desires of England's urban dwellers with the spatial forms of the docks and the material spatial practices demanded of global trade:

    The only thing, one comes to feel, that can change the routine of the docks is a change in ourselves. Suppose, for instance, that we gave up drinking claret, or took to using rubber instead of wool for our blankets, the whole machinery of production and distribution would rock and reel and seek about to adapt itself afresh. It is we — our tastes, our fashions, our needs — that make the cranes dip and swing, that call the ships from the sea. Our body is their master. (1931/2006; 14–15)

This point is echoed by David Harvey, who observes that the shape of city-regional space is “symbolic of our culture, symbolic of the existing social order, symbolic of our aspirations, our needs, and our fears” (1973; 31). Harvey understands place as the continuously-enacted outcome of struggles between (or among) competing sets of aspirations, needs, and fears. He suggests that if “we are to evaluate the spatial form of the city, we must, somehow or other, understand its creative meaning as well as its mere physical dimensions” (1973; 31). London's growth during the 18th- and 19th-centuries expressed a particular “machinery of production and distribution,” whose sociospatial development shifted ever-downstream toward the ocean, as maritime innovations enabled, and commercial shipping strategies demanded, ever larger shipping vessels. In recent decades, container ships — whose dimensions and capacities became too large to journey up the River Thames — have required the development of deepwater docks on the
Thames Estuary, such as those at the Port of Tilbury. This spatial shift came not without social cost, as the closure of the Thames River docklands left its landscape to decay and its dockworkers to poverty and unemployment.

What the various modes of nautical mobility once enabled for Woolf's London, those of the atmosphere now enable for countless city-regions that, by historical or spatial circumstance, developed without need for expansive linkages via ocean or waterway. Aeromobility has allowed many city-regions to engage in exchange relations with urban regions to whom overland or overwater access is either impractical or impossible. As with nautical spatial production, the material spatial practices enabling passenger aeromobility have taken shape through their complex interplay with (and within) a dynamic mix of forces. One set of forces — the political-economic — operate within the local relations of a particular place, or within relations between places. The other set of forces — the physical-ecological — constrain and condition movement through or within a fluid: in the case of nautical mobility, this fluid being water; in the case of aeromobility, atmosphere.

This concluding chapter addresses what this dissertation has told us about the mix of forces particular to the Los Angeles city-region and its aerial spatial production. It proceeds in three parts. The first discusses the key findings of the dissertation in relation to the questions I raise in Chapter One. The second part identifies the major contributions of the dissertation, particularly for urban policy research and analysis. The third and final section suggests future research and theorization which may proceed from this dissertation.

**Summary of Findings**

What I have done verifies or supports Harvey's call for harmonizing our understanding of urban social process with that of urban spatial form (1973):
It is a problem of exercising a wise control over social and spatial organization within the city system. Here an enormous task confronts us. We really do not have the kind of understanding of the total city system to be able to make wise policy decisions, even when motivated by the highest social objectives. The successful formation of adequate policies and the forecasting of their implications is going to depend on some broad interdisciplinary attack upon the social process and spatial form aspects of the city system. (94-95)

Here, Harvey calls for us to recognize that any urban spatial form — whether aerial or terrestrial — develops through, and according to, a correlative set of social processes. Planners of urban systems must therefore develop conceptual understandings that more fully integrate social process with spatial form. Such understandings might enable us to achieve clearly articulated social goals through policies designed to alter spatial form, or vice versa. The preceding dissertation comprises my attempt at integrating the two urban dimensions in a conceptual framework which relates the social production of a city-region's terrestrial space with that of its aerial space.

I have looked at the Los Angeles region empirically and conceptually from two perspectives. According to the first perspective, city-regional aeriality dynamically remaps the city beyond its jurisdictional boundaries, extending Los Angeles into interactive, overlapping relationships with city-regions. According to the second perspective, the internal political-economy of the Los Angeles city-region has become reflexively embedded within the atmosphere — continuously, as Los Angeles is one of the most intensive global nodes for the production of aerial space, and also historically, as the region once served as a center for the global aerospatial industry. In the following section, I summarize the findings of the dissertation and discuss how it adds to our knowledge of the Los Angeles city-region as it has been relationally-constructed within multiple, overlapping aeromobility networks. The first section

70 Related to a diverse range of urban activities, including passenger traffic related to business and tourism, as well as other activities wholly unrelated, including cargo operations, recreational aviation, automobility (e.g., smog), policing, surveillance, firefighting, and national defense.
addresses Los Angeles aeriality as it extends the aerial space of the region. The second section comprises a two part discussion of aeriality as it relates to the internal functions of the Los Angeles city-region.

**Extensive Production**

Aeriality creates a set of spatial dimensions for a city by which commercial air travel remaps the aerial boundaries of the jurisdictionally-bounded city in ways that are often unpredictable and difficult to understand, and whose development often exceeds the governance capacities of local and regional institutions. In this dissertation, I describe the shifting situation of Los Angeles as an urban node within globe-spanning air transportation networks. I identify and analyze some general trends in the connectivity of the Los Angeles city-region within nested, overlapping networks of interurban aerial relationship and exchange. The dissertation conceptualizes LAX, in particular, as a prominent node within three such aerial networks: as the central facility within its immediate regional airport system, as a competitor for air traffic with other major airports in the Western United States, and as a key West Coast gateway for international air traffic involving Australasia, Asia, and (to a large yet diminishing extent) Central America.

The roles of LAX within each scalar frame come together in complex, often antagonistic relationships. LAX is central to the political-economic strategies of its local Los Angeles city-region, for example, particularly as it competes for profitable international passenger routes with other markets in the Western United States, including San Francisco and Denver. From the perspective of the international air carriers providing these routes, LAX and its competitor airports are judged primarily according to their surrounding markets' ability to generate passenger demand, either as ready-made *centers* within a concentrated pool of potential origin-destination passengers, or as *centralizing* hub nodes able to efficiently process connecting flights.
Moreover, LAX relates strongly within a smaller network of more highly-specialized international gateway facilities within the United States (e.g., JFK, Newark Liberty, Miami, and San Francisco). Recent innovations by aircraft manufacturers have produced large, efficient aircraft (i.e., the A380 and 747-8), which can make direct connections between virtually any two city-regions on the earth's surface, no matter how distant. The capacities of these aircraft enable *concentrated* aeromobility networks, wherein gateway airports such as LAX — whose surrounding city regions already generate substantial demand for air travel, and whose facilities already accommodate larger international aircraft — stand to accumulate a greater proportion of US linkages within a shrinking pool of more intensely-connected, internationally-linked city-regions.

The potential for such a purely concentrated competitive landscape has been displaced, however, through corresponding innovations among air carrier network strategies, which have deconcentrated aeromobility networks. In their pursuit of flying planes more fully-loaded, carriers have become more responsive to shifts in demand between and among city-regional markets. The emergence of low-cost carriers, for example, has improved absolute levels of air travel access within many areas of the United States and Europe; LCCs such as Ryanair and Southwest Airlines maintain point-to-point network structures, which often link second-tier airports located on the periphery of major city-regions. To take another example of shifts in carrier strategy, the peripheral position of LAX within domestic air traffic networks has in part forced Latin American-based carriers to integrate more centrally-positioned city-regions, such as Dallas and Houston, within their international networks. Over the past two decades LAX has handled a declining share of Latin American air traffic relative to these and other airports — also including, to a lesser extent, Atlanta — which have increasingly specialized as hubs linking Latin American air traffic networks with those of North America. Miami International Airport has served in this capacity for decades; LAX, decreasingly so. At LAX, the relative decline in Latin American air traffic also comes as a result of more globally-oriented transpacific carriers —
Qantas, All Nippon Airlines, China Southern, Emirates — initiating or expanding service at LAX. The pivot of Los Angeles aeriality towards transpacific linkages — and their attendant passenger volumes and aircraft size — has been a major driver of air traffic regionalization discourse. The politics of regionalizing Los Angeles-area air traffic has been primarily focused on freeing up LAX for more specialized international passenger traffic by distributing domestic passenger traffic across the other facilities in the Los Angeles regional airport system.

Thus, the local political-economic interests of Los Angeles — namely, its focus on LAX to compete with other Western US airports for air carrier traffic — has served to expand the airport's involvement as a gateway between United States air traffic networks and those of East Asia, Australia, and the Middle East. This involvement has been mediated by innovations to both the formal and processual dimensions of aeriality. On the one hand, aircraft manufacturers have employed computer-aided modeling and lightweight construction materials to develop aircraft capable of carrying more passengers over greater distances than previous aircraft designs, and often at greater fuel savings. And, on the other hand, airlines have employed these more efficient aircraft (alongside existing fleets) in network arrangements designed to conform to market demand by supplying aircraft whose capacities (e.g., range, available seats) are better fits for the actual distances- and passengers-flown for each route. These transformations to aerial spatial production have led to complementary changes within the forms and processes of Los Angeles itself, as the city-region becomes squeezed from its positions in some networks, and stretched into new relations within others.

LAX, as one of the busiest gateway facilities in all of North America, and the single busiest on the West Coast, enables a globally extensive relational hinterland comparable to only a handful of airports in the world. The processes enabling these vast global extensions comes at a high cost to local urban dwellers, who must endure correspondingly intense concentrations of traffic, noise, and air pollution surrounding LAX. The gradual shift in LAX international passenger traffic towards the quickly growing economies across the Pacific Rim — particularly
origin-destination traffic involving China and the transglobal hub traffic involving the United Arab Emirates — suggests Los Angeles will become increasingly integrated within transpacific aerial production networks over the next decade. Assuming these regional trends continue, the growing passenger volumes will impose escalating costs upon those dwelling in the urban areas adjacent to LAX. The demand for transpacific air travel to the United States, particularly from Australasia and Eastern Asia, will also eventually outstrip the capacity of LAX, forcing international carriers to opt for more capacious international airports in the western United States (e.g., DEN, DFW, or SFO) unless the Los Angeles region somehow expands its airport capacity, either by increasing that of LAX or by enlisting unused capacity at other city-regional airports, including 1) those active within air passenger networks, as well as 2) those inactive within passenger networks (e.g., military bases, or general aviation airports), or 3) those altogether dormant to aerial activity of any type. The LAX-centered regional airport system thus produces not only a vast aerial-spatial hinterland but also a local politics of space that “must be able to take account of the constitutive relations of the social, historical and spatial” (Stuart Elden (2004; 100).

As the aeriality of Los Angeles becomes squeezed and stretched — within its immediate regional airport system, among a more widely-dispersed network of city-regions in the Western United States, as well as those serving as international gateways — it has thus given rise to terrestrially-focused local political-economic struggles over how the Los Angeles city-region should reconfigure its airport system for handling actual volume of passengers it currently receives and, perhaps more importantly from a planning perspective, the potential volumes of passengers heralded by shifts in aeriality, whether demographic, technological, or — as in the case of the 2010 ash cloud from Iceland's Eyjafjallajökull volcano71 — ecologic.

71 The eruption of Eyjafjallajökull in April 2010 led to the most intense disruption of air travel between the Europe and North America since the end of the Second World War. There have been other recent disruptions of air travel due to volcanic activity, though none so great as that of
Efforts by planners and policymakers to radically reconfigure the position of Los Angeles within nested, overlapping sociospatial networks do not, therefore, necessarily require significant investment within, or alterations to, the existing infrastructure of the city-regional airport system. This latter factor relates to a key finding of my research into the El Toro struggle: I situate the development of a regional political context in part within the physical-ecological relationship between El Toro as a terrestrial site and El Toro as a site of aerial-spatial production. This relationship needs to be taken into account if we are to understand the relational construction of city-regions, including the institutional actors and political context by which they are governed. Thus, I find that Harvey’s calls for “the kind of understanding of the total city system” which facilitates “wise policy decisions” in the aerial realm must account for the physical-ecological relations which condition aerial production, and not merely for the political-economic relations (at whichever territory, place, or scale). For if the former set of relations primarily condition the extension of city-regional boundaries via flight itself, then the latter condition the intensity of aerial spatial production related to a particular city-region. The following section addresses this second perspective on Los Angeles city-regional aeriality, which suggests that the internal political-economy of the city-region is inextricable from its production of aerial space.

Intensive Production

The political-economy of the Los Angeles region is both producer and product of aerial space. On the one hand, the Los Angeles region served as the center of domestic aircraft production and aerospatial design for over five decades — coincident with the region's greatest period of population growth: a time during which Los Angeles cemented its role as a center for

Eyjafjallajökull. These include disruptions of transpacific air travel along the Pacific Rim. In 2011, for instance, the Puyehue volcano, in Chile, forced flight cancellations in South America Australia (D'Alessandro and Kraul, 2011; Critchlow and Craymer, 2011).
both the motion picture industry and American automotive culture. The decline of the region's aero spatial industry since the 1970s, however, has largely extricated the politics and economy of Los Angeles from this aspect of aeriality. At the same time, however, the products of the aero spatial industry are significantly altering the atmospheric boundaries of urban regions such as Los Angeles. An earlier discussion of the recent generation of superjumbo aircraft (Airbus A380 and Boeing 787), for instance, details the capacity of innovative aircraft design and industry practices to reconfigure the position of city-regions within global air travel networks.

This perspective — on the inextricability of Los Angeles aeriality from its city-regional politics and economy — provides us with a better understanding of the interactive relationship between the internal, terrestrial space of the city-region and the dynamics of its ever-shifting aerial footprint. The current generation of superjumbos — and subsequent generations of lightweight passenger aircraft — will give rise to qualitative changes in the production of aerial space, and therefore of the internal politics and economies of terrestrial city-regions, generally. I have cited numerous examples in which the internal spatial politics of a city-region interact with and within its atmospheric space. These policy intersections often regard the planned usage of particular tracts of terrestrial space as sites for aerial spatial production (i.e., as airport facilities).

For example, significant portions of Chapters Four and Five are devoted to the protracted political struggle over the reuse of MCAS El Toro. Though the specifics of this struggle officially began with the announced closure of the base, planners and others involved in aerial governance for the Los Angeles region had long ago recognized, first of all, the need to distribute traffic from LAX to the region's numerous peripheral airports and, second of all, the potential of El Toro to serve as a key site in these regionalization plans. This recognition was driven partially

72 While automobility contributed to postwar patterns of suburbanization — and corresponding declines in the population and density of traditional urban cores — particularly in the Northeastern United States, it had more or less the opposite effect in the Los Angeles region, which increased in both population and density in the wake of the Second World War.
by the rising position of LAX within a handful of densely-traveled air traffic networks, itself the continuously-enacted outcome of several factors, including the growth of international markets, improved access to air travel, as well as aerospatial and policy innovations which lower the price of airfares. It is not only developments in aerospatial technologies but also broader changes in global economic conditions which reconfigure the boundaries and relations of city-regions, as in, for example, the elevated position of LAX within Asian and Latin American air travel networks. The internal political-economy of the Los Angeles city-region with regard to its atmosphere, therefore, expresses the dynamic interaction among these and other factors.

The network structure and corporate logic of air carriers also contributes to shifts in the aerial boundaries of city-regions. Two earlier-cited examples demonstrate how the decisions of airlines can have significant consequences for aeriality. First, two of the carriers offering service at John Wayne Airport publicly opposed any El Toro reuse plan that proposed a so-called “turn-key” approach, in which both John Wayne and El Toro would have been used in some complementary, side-by-side manner. In a letter to Orange County aviation planners, a vice president at United Airlines claimed dual-airport systems such as the one proposed, “dilute operating efficiency, substantially increase operating costs and could result in less service to the community” (1998). Airline involvement in aeriality extends beyond public support for plans and policies affecting their operations. Far more often, airlines alter the structure of city-regional aeriality by altering their own network structures and strategies. Many traditional low-cost carriers (LCCs), for instance, have reached operating capacity, allowing them to compete with legacy carriers on convenience and accessibility, instead of merely on fare cost. In some cases, LCCs have done this by shifting all or a portion of their operations from more affordable peripheral airports to more accessible, better appointed, and therefore more expensive hubs, such as LAX. An earlier discussion from Chapter Three addresses numerous such shifts that have taken place in the Los Angeles city-region, including LCCs transferring a busy route to LAX (JetBlue), cutting back on flights at a peripheral airport to focus on LAX operations (Southwest),
or entirely abandoning a peripheral airport in favor of LAX (Great Lakes Airlines). These and other strategies pursued by commercial carriers manifest across the sociospatial landscapes of a city-region, transforming both the internal quality and external influence of its political, economic, and cultural life.

The activation and deactivation of service across particular city-regional airports by individual air carriers mirrors a still broader set of strategies by which planners in the Los Angeles city-region have worked to incorporate peripheral airports into the regional system. They have attempted such a repatterning of air passenger flows for a variety of reasons, chief of which is to ensure LAX can fulfill its primary role as international gateway.73 Because only so many planes can safely take off and land from LAX, transportation planners have found it necessary to activate74 the Los Angeles region's peripheral airports into a coherent network across which aviation planners may then more evenly redistribute the regional air traffic, whose increasing congestion is due largely to recent and excessive global demand. As happened with air traffic regionalization programs adopted by planners in Boston and New York, the internal politics of the Los Angeles city-region have shifted towards a need for creating a regional airport network design to allow a more equitable, more efficient distribution of regional air traffic.

El Toro is only one flashpoint within the decades-long conflict over how best to manage and transform air travel within the Los Angeles region. The regional need for redistributing air traffic has spawned several political struggles regarding airport facilities. These have taken place, on one hand, over currently operational airports and, on the other hand, over the proposed airport reuse of flat, expansive terrestrial spaces in the Los Angeles region.

73 See discussion in Chapter Five.

74 Activation may occur via a range of practices, including new construction, renovation, and improving surface connections linking remote facilities with population centers.
A number of these struggles are ongoing and threaten to derail all hopes within the Los Angeles region of a real and lasting air traffic regionalization strategy. The following three paragraphs summarize three such flashpoints which, in addition to the El Toro case described in detail across the previous two chapters, illustrate the tension between terrestrial-spatial utilization and air traffic management within the Los Angeles city-regional airport system.

The first and least contentious of the three comprises ongoing efforts by Orange County government, the City of Newport Beach, and other stakeholders, to maintain the John Wayne Airport Settlement Agreement of 1985, whose noise regulations and environmental protections expire in 2015. The previous amendment process (in 2003) raised the limits on departures and passengers, and entirely abolished limits regarding terminal square-footage and parking capacity at the airport. A contentious planning process either during this cycle or in future renegotiations could once again allow OCX proponents to restate their case.

The second flashpoint centers on the controversial $4.8 billion expansion plan for Los Angeles International Airport. The Los Angeles city council approved the FAA-endorsed plan in Spring 2013. The plan would add capacity alongside the newly-renovated Tom Bradley International Terminal, which had already expanded terminal capacity for international travel. The most contentious measure of the new plan includes the relocation and expansion of the north runway, as well as the construction of a wider taxiway able to accommodate the current generation of superjumbo passenger aircraft (Lowrey, 2013). Leaders and elected representatives from the communities surrounding LAX have long opposed various proposals for expansion, mostly over concerns about increased noise and air pollution (Moore, 2013). The costs and scale of the expansion projects throws into stark relief the political and economic difficulties associated with distributing air traffic more evenly throughout the regional airport system.

75 The Tom Bradley International Terminal renovation project cost $4.11 billion. The proposed north runway relocation and expansion project is estimated at another $4.8 billion.
The third and final struggle for control of Los Angeles aeriality comprises the ongoing negotiations between the cities of Los Angeles and Ontario regarding ownership of LA/Ontario International Airport. Los Angeles assumed ownership and control of the airport in 1967 despite its location within the municipal jurisdiction of nearby Ontario, well beyond the city-limits of Los Angeles. Under the ownership and management of LAWA, LA/Ontario grew to become the second busiest airport in the region and among the busiest origin-destination airports for low-cost carriers, including JetBlue and Southwest. In the years following the global economic crisis of 2008, however, passenger volumes at LA/Ontario declined by nearly half. In 2010, The City of Ontario and SCAG alleged that Los Angeles World Airports (LAWA) mismanaged LA/Ontario, chiefly by increasing the airport's operating costs and cutting its marketing budget, making it less competitive with other airports in the region. In a report issued by the City of Ontario in late-2010, the city suggests that LAWA's ownership of both airports constitutes a conflict of interest, leaving LAWA with little incentive to promote regionalization strategies, including those that would divert a portion of its profitable passenger traffic from LAX to ONT (City of Ontario, 2010). The report points out that, unlike the other airports in the region, expanded passenger operations at LA/Ontario are impeded neither by passenger caps (as with SNA), noise caps (LGB), facility constraints (BUR), nor distance from downtown Los Angeles (PSP is nearly two-hours drive). Local control of LA/Ontario promises to increase competition among the region's airports — with improved air traffic regionalization as a potential outcome. Negotiations regarding ownership and transfer have stalled recently (as of February 2014) after the two parties failed to reach an agreement: LAWA wanted to sell the airport; Ontario wanted to assume ownership by taking on the airport's debt and covering the costs of transfer (Weikel, 2014). The LA/Ontario ownership conflict further illustrates the political and economic fragility of air traffic regionalization within Los Angeles.

Apart from deciding how best to manage or expand existing facilities, debates surrounding the proposed airport reuse of terrestrial sites have often taken account of how
aviation reuse will modify the aeriality of the region. This was the case in Orange County throughout the 1980s, when the board of supervisors authorized its Airport Site Coalition to evaluate potential locations for an international airport to complement Los Angeles County's LAX. The coalition's study list included some two dozen sites across the county. These were assessed according to how airport operations at each might affect a number of urban atmospheric conditions, including aircraft safety, noise levels, and air quality (Perlman, 1988). Throughout the political struggle over the reuse of former MCAS El Toro, for instance, much of the public debate coalesced around how airport operations as planned might alter adjacent aerial space — particularly with regard to noise levels over neighboring communities, and air traffic congestion within the flight corridors for LAX, John Wayne, and LA/Ontario. The El Toro debate incorporated another dimension of aeriality, as well. My research into the failure of the airport reuse plan suggests that planners must take account not merely of terrestrial relations nor merely of aerial ones; instead, planners must evaluate the aerodynamics of terrestrial sites: to focus on the performance of aeriality, and not merely on how potential airport operations may relate with other urban activities taking place either aerially or terrestrially. And, because flight is a sustained interaction between objects and physical forces, such an evaluation must also integrate an understanding of aircraft capacities and technological change. Some forty years ago, David Harvey (1973) claimed that:

[f]orecasting the future of an urban system requires a thorough understanding of the processes generating change and a realistic evaluation of the direction in which the social system as a whole is being moved by those processes. (94)

The globalizing economy relies on responsive modes of communication and transportation, including passenger and cargo aeromobility. This reliance on aerial linkages has led to the gradual reconfiguration of everything from supply chains to corporate structures to cultural practices to urban space itself, as the sites and practices of air travel have become integrated within everyday life over the past century. Among these, the most common — airports — have
not only become vast technological assemblages: organizing people, objects, and practices for the routine production of aerial space. Airports have also become key sites for the “processes generating change” within the political, economic, and social life of city-regions. Previous authors within the urban policy and planning spheres have adequately conceptualized the need to understand aerial space as it is performed by and within systems of grounded infrastructures and governing institutions. But little attention has been paid to addressing the policy and planning issues which relate directly to flight itself, particularly the capacities of aircraft in relation to atmospheric or topographic conditions. Answering Harvey's call for developing a better understanding of “the processes generating change,” therefore demands that planners attend not only to the predicates and consequences of passenger aeromobility, but also to the material spatial practices involved in aeromobility itself — the physical forces enabling flight and the technologies which perform it. This is what is meant by an urban aerodynamics.

**Contributions**

In this section, I summarize two significant contributions this dissertation offers for authors invested in urban planning or policy research.

First, this dissertation offers a conceptualization of urban and regional development as both embedded within, and productive of, aerial space, particularly through the forms and processes surrounding passenger air travel. Authors invested in Global Cities Research have often employed methods for measuring, comparing, and analyzing urban nodes within networks of interurban air-passenger exchange. Studies in this vein have examined the relationship between air traffic networks and other markers of urban characteristics, including urban economic functions (Dresner, 2006; Derudder et al., 2008), the internet backbone (Choi et al.,

76 For instance, grounded infrastructure, governing institutions, and their terrestrial relations.
2006); and the global corporate organization strategies (Taylor et al., 2007). Others have examined how the centrality of cities within air traffic networks correlates with employment and other measures of local economy (Taaffe, 1956; Irwin and Kasarda, 1991; Goetz, 1992; Ivy et al., 1995; Brueckner, 2003). There has not yet been, however, any sort of meaningful or sustained research program which focuses on the development of aerial connectivity — especially international linkages — and the effects it has upon the form and dynamics of airport-enabled city-regions.

Second, the preceding research diverges from much of the aforementioned literature in that I am less interested in examining air traffic linkages for understanding urban hierarchies and interurban exchange, and more for what these linkages can tell us about how city-regions produce and occupy aerial space itself. Of course, it is worthwhile and important for authors involved in Global Cities research and other fields to focus on the airports most central to the global order, including JFK, Heathrow, Hong Kong, and Dubai — as well as describing the condition and dynamics of the networks these and other major airports enable. It is equally as vital, however, to examine what effects these global networks have upon the development — aerial or otherwise — of city-regions in which they become embedded within, or disembedded from, local landscapes. We may gain a broad understanding of city-regional development by asking how or why global air traffic networks go. But asking where they go offers us still deeper insight into the highly-contingent, highly-differentiated processes by which the aerial surface of global air traffic relates with the terrestrial surface of city-regions.

Beginning with the first commercial passenger routes in the early-1900s, a globe-spanning air travel assemblage (e.g., aircraft manufacturers, airlines, airliners, airports, passengers, etc.) has continuously produced an aerial-spatial surface composed of a “fibrous, thread-like, wiry, stringy, ropy, capillary character that is never captured by the notions of levels, layers, territories, spheres, categories, structures, or systems” (Paasi, 2004; 541). This nebulous surface of aerial tracings and retracings, on the other hand, must necessarily come to ground in
co-productive moments of interaction with the “levels, layers [and] territories” of the terrestrial-spatial surface. Airliners need to land, after all. What I have demonstrated in the preceding research is that the process by which commercial passenger airports emerge within city-regions involves the complex interplay of political negotiation with the physical forces enabling (or disabling) flight.

**Future Research and Theorization**

This dissertation has addressed only one dimension of aerial spatial production. Though commercial passenger air travel is among the most familiar and common mode of dwelling-in-the-air, it is certainly not the only mode with relevance to our understanding of how contemporary city-regions become constructed via aerial spatial production.

Other research on passenger aeromobility might analyze the broader range of services and aircraft available for transporting humans, including private jets, commuter shuttles, charter airlines, medical evacuation, helicopter tourism, recreational aviation, and prisoner transports. Apart from addressing the interurban connectivity these forms allow, researchers could survey the material spatial practices — including the airborne equipment and terrestrial infrastructure — required for their sustained use. In a related vein, researchers might focus on the causes and consequences of urban areas which have either lost all long-distance aerial linkages, or never had any such connectivity in the first place.

Aeromobility enables a wide range of actors to produce urban space only incidentally related to the transport of humans from one place to another. Freight operations, for example,

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77 This could include aircraft contracted by the United States for providing extraordinary rendition: the extra-legal transport of people suspected of planning or committing acts of terror. *An Atlas of Radical Cartography* (Mogel and Bhagat, 2009) presents a map by Trevor Paglen and John Emerson. The map, entitled *Rendition Flights 2001–2006*, uses publicly available data to map the paths flown by aircraft either owned or operated by the CIA or its associates (see map at http://www.strozzina.org/cms/p/p000225/PAGLEN_OK_100072386.jpg).
remain among the most understudied aspect of air transport generally, primarily due to the difficulty of obtaining useful, timely data. Whereas the FAA and TSA, along with many other international regulatory bodies regularly collect and disseminate highly-granular data on commercial airline passengers, useful data on commercial air freight operations is the property of the shipping companies themselves. The only freely available data is highly aggregated for most domestic airports according to tonnage and, in many cases, category of goods transported — unlike commercial airline data, there is no breakdown of the capacities and actual cargo volumes processed by the individual air freight companies. There is a significant gap awaiting researchers with connections (or funding) sufficient enough to investigate urban air cargo connectivity in as much detail as many previous studies have examined passenger aeromobility.

As addressed in the El Toro discussion, urban regions and their correlative aeriality are embedded within a multiscalar urban system. Delays or other events taking place at one airport have consequences which ripple across other airports in the network. Flights and aerial networks are often affected, however, by the imperatives of national governments, for whom access to airspace is frequently the topic of economic or environmental negotiations with other sovereign states. Apart from its relationship with the other actors addressed within this dissertation (e.g., the airline industry, municipalities), the federal government also enters into formal arrangements which can impose, remove, or otherwise alter international regulatory boundaries, potentially shifting the aerial boundaries of city-regions. This relationship — between internationally agreed-upon aerial boundaries and city-regional aerial production — requires further research, especially into how these relationships are (directly or indirectly) mediated by national governments. Obvious examples of this include bilateral, or multilateral, air transport agreements between two or more contracting national governments. Other examples include No-Fly Zones, in which one or more governments actively prohibit another government actor from operating aircraft over all or a portion of its territory. The Anglo-American enforced no-fly zone over Iraq from 1991 to 2003, for example, had widespread deleterious effects on terrestrial life beneath the
zone itself (though the ostensible reason for the zone's imposition was to protect civilians from bombing campaigns authorized by Saddam Hussein's regime). Australian journalist John Pilger has documented some of the terrestrial consequences of the Iraqi no-fly zone:

Between July 1998 and January 2000, American air force and naval aircraft flew 36,000 sorties over Iraq, including 24,000 combat missions. In 1999 alone, American and British aircraft dropped more than 1,800 bombs and hit 450 targets … [making it] the longest Anglo-American aerial campaign since the Second World War. (2003, no pagination)

As airspace plays host to an increasingly dense tangle of legal and illegal activities, future research might inventory and examine no-fly zones and related practices by which actors — whether formal (e.g., the United States government) or informal (e.g., Syrian rebels equipped with surface-to-air missiles) — deny other actors the ability to produce aerial space. Researchers might examine the increasing imposition of no-fly zones by civil authorities outside theaters of war. The G8 summit in summer of 2013 took place near Belfast, Northern Ireland. As head of security for the summit, the PSNI (Police Service of Northern Ireland) imposed air-travel restrictions throughout certain corridors and zones in which (or though which) summit-related activity and travel took place (Belfast Telegraph, 2013).

The increasing application of unmanned aerial vehicles (UAVs) to produce aerial space raises interesting questions regarding the relationship between terrestrial and aerial modes of life. Future research in the vein of this dissertation might focus on how terrestrial patterns of urban life (i.e., routes and routines) adjust to accommodate or resist the remotely-directed aerial activity enabled by these so-called drones. Related work might address or integrate the longstanding use of police aircraft and the emergent deployment of UAVs among domestic police departments. Moreover, the (current) low cost and minimal barriers for owning and operating UAVs will likely contribute to an increased crowding of airspace, particularly in dense urban regions such as Los Angeles, where the aircraft may be used not only for surveillance, but also for purposes including cargo transport, advertising, and environmental monitoring. The
proliferation of UAVs performing these and other functions, along with steady increases in the number of cargo and passenger flights — private and commercial, alike — threatens to outstrip the capacity of the institutions and technologies for safely and effectively regulating the production of airspace, particularly within dense urban regions and the aerial corridors by which they interlink. Future research in this vein might examine the extent to which aerial overcrowding already occurs, or might otherwise consider the consequences and potential solutions for its inevitable occurrence in Los Angeles and other city-regions.

I have occasionally cited examples from popular culture which help illustrate the terrestrial-atmospheric relationship. One cannot overstate the cultural importance of aerial spatial production, whether actual or speculative. The relationship between modes of terrestrial and aerial dwelling, for example, has deep significance to many world religions. Among the three largest Abrahamic faith groups — Christianity, Islam, and Judaism — many believers have at various times conceptualized an afterlife that takes place in an aerial Heaven, accessible only via some form of spiritual or bodily ascension.  

Many of the major Judeo-Christian religions affirm the literal or figurative reality of a passage from Revelation (21:1-27), in which the book's author describes a vision of a post-apocalyptic city of New Jerusalem after its aerial descent. Though belief in an airborne heavenly realm has diminished among believers (and non-believers, for that matter) since the Middle Ages, the idea of a cloudlike Heaven remains central to visual media representations of an afterlife (including humorous and satirical representations). Moreover, many of the figures and deities central to the sacred myths of virtually all major religious traditions often possess the power of flight, in many cases serving as guardians, intermediaries, 

78 It is worth noting here that some traditions consign the wicked (or, in some cases, mere nonbelievers) to an afterlife of suffering and torment in a subterranean Hell.

79 For a discussion and list of satirical depictions of “Fluffy Cloud Heaven,” see http://tvtropes.org/pmwiki/pmwiki.php/Main/FluffyCloudHeaven.
or transgressors of the boundary between earth and the heavens (or Heaven). Future research related to the concepts contained within this dissertation might examine how myths and stories related to aerial-spatial production continue to mobilize and perform terrestrial places and practices.

Finally, visual and written media often use passenger aeromobility as a backdrop for exploring the problems with our technologizing, globalizing culture. In many of these works, the places of aeromobility serve as the archetypal “non-places” of passage between real places: airport lounges, terminals, bathrooms, and ring roads — not to mention the airplanes themselves. In Christopher Nolan's Inception (2010), nearly all of the film's action occurs within a series of dreams-within-a-dream created in the mind of a sleeping business executive aboard a 747 enroute from Sydney to LAX. The protagonist (played by Leonardo DiCaprio) and his team are tasked with planting the seed of an utterly selfless thought within the mind of the profit-motivated executive without his realizing it. To do this, they must enter his dreams and engage with his subconscious: imposing their consciously constructed dreamscapes upon his own. The film's conflation of the practice of air travel with the places of dreaming suggests that aeromobility creates zones of ambiguity and exception: a sort of dreamstate, untethered from the conventions and physics which govern terrestrial life.

Walter Kirn's 2001 novel Up in the Air tells the story of Ryan Bingham, a management consultant who flies around the United States firing people in his quest to collect one million

80 This list includes, among countless other, Zeus (along with Hermes and many other gods of Greek and Roman antiquity), Jesus of Nazareth, the prophet Muhammad, the Sphinx, the winged Mesoamerican deity Quetzalcoatl, and various gods and other figures within the Hindu tradition(s) who make use of vimâna (flying chariots). Peripheral figures from many religions are also said to be capable of flight, including angels, seraphim, cherubim, the Phoenix, and Icarus, who remains a potent symbol of human aspirations for flight.

81 The Oscar-winning film adaptation of Up in the Air (2009) leaves many of the novel's major themes intact.
frequent flier miles (before he himself is fired). Bingham identifies as a member of the (aero)mobile public (Sheller, 2002) — what he calls his “telephone family, strung out along the wires” (3). Because he spends more of his time flying from place to place, his everyday life subverts traditional relationships between aerial and terrestrial modes of dwelling, forcing us to consider how aerial-enabled modes of urban living have given rise to people like Bingham, who supposes himself a new form of urban dweller:

a sort of mutation, a new species, and though I keep an apartment of storage purposes — actually I left the place two weeks ago and transferred the few things I own into a locker I've yet to pay rent on, and may not — I live somewhere else, in the margins of my itineraries. (4)

Bingham is a member of an aeromobile public (Sheller, 2002), in a place he calls Airworld. Like the dreamstate of Inception, Bingham's Airworld is a slightly-off facsimile of the terrestrial world below, with its own customs and possibilities:

In Airworld, I've found, the passions and enthusiasms of the outlying society are concentrated and whisked to a stiff froth...I find it possible here, as nowhere else, to think of myself as part of the collective that prices the long bond and governs necktie widths. Airworld is a nation within a nation, with its own language, architecture, mood and even its own currency — the token economy of airline bonus miles that I've come to value more than dollars. Inflation doesn't degrade them. They're not taxed. They're private property in its purest form. (9)

Future research into urban aeriality should engage with these and other representations of aeromobility in all its forms. Compelling accounts of aerial dwelling (whether fictionalized or otherwise) do not merely reveal or embody the spaces of everyday life. They may also serve to liberate society from current modes of social production, perhaps by allowing us to conceive of alternative, utopian visions for our (aerial) lives — or to avoid dystopian visions of the same.

Final Thought

The struggle for El Toro centered on how best to reuse a former airfield. The three conflicts cited earlier — the renegotiation of the John Wayne Airport settlement agreement, the
proposed expansions at LAX, and the LA/Ontario ownership struggle — are representative of the air traffic situation in Los Angeles; each takes place at a nexus of multiscalar political and economic interests, where the social lives and spaces of airport neighbors become reconfigured over time through sustained or periodic encounter with global air travel, a central element for producing “a new geographic configuration that can better accommodate the powerful expansionary, conflictual, and technological dynamic of a restless, shifting capital flow” (Harvey, 2001; 338\textsuperscript{82}). Similar conflicts play out in city-regions throughout the world, as air travel demand continues to outstrip air travel capacity — not only of airport facilities themselves, but also of their capacity for expanding into surrounding terrestrial spaces as well as for making safe and effective use of adjacent aerial space.

More research is needed into these cases, not only as discrete phenomena but holistically, as tangled bundles of aerial-spatial relations, whose continuous interaction with and within globally-expansive air traffic systems is therefore also in continuous interaction with and within globally-expansive political-economic and physical-ecological systems. The discussion of Los Angeles city-regional connectivity suggests that air travel is highly subject not only to global economic and demographic changes but also to innovations in aerospatial technology and carrier network strategies. An earlier discussion of the El Toro reuse struggle illustrates two interrelated sociospatial issues with regard to the reuse of terrestrial sites for aerial spatial production. First, Los Angeles city-regional planners and policymakers have recognized the need to regionalize air traffic in order to free-up LAX for accommodating the increasing volumes of transpacific passengers and ever-larger aircraft. Second, the reusable terrestrial sites are inextricable from local forces — both political-economic as well as physical-ecological — which require a thorough understanding by regional air traffic planners. As the internal politics of city-regions

\textsuperscript{82} cf. Harvey, 1978; 1982; ch. 13.
increasingly move towards the need to redistribute air traffic throughout a coherent network of regional airports, urban policy and planning scholarship should make room on research agendas for developing empirical and conceptual understandings of what I describe here as *urban aerodynamics*.

As I have described more fully in the preceding chapters, the limitations of international air traffic data prevent us from fully comprehending the globally-expansive configuration of passenger air traffic involving Los Angeles — or any other city-region, for that matter. We can certainly begin to develop understandings of contemporary urban systems using current air traffic data. We can also begin to incorporate these understandings within the growing body of theory which takes the aerial as a site of urban social and spatial analysis. But if we cannot *see* linkages beyond direct connections, we fail to take full account of city-regions as they are relationally constituted by actors beyond the network logic of airlines networks. Despite these limitations, however, being able to map the condition and dynamics of direct linkages allow us to trace the immediate aerial footprint produced by our city-regions. Without the postwar expansion of air travel and the “development of airports in facilitating the large-scale movement of passengers and freight, globalization in its current forms would be ‘utterly different, possibly non- existent” (Urry, 2007). The international air passenger traffic involving Los Angeles city-regional airports thereby articulate locally-intensified sociospatial relations within extensive global networks even as it reconfigures these locally-intensified sociospatial relations themselves.
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