selfish architecture:

DARWINIZING FLIGHT-RISK BUILDINGS.

A TEST OF THE VIABILITY OF ROCKCLIFFE AIRPORT.

by **ROBERT ANTHONY REINIER VAN LIN**

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SELFISH SELFISH

SELFISH *>adjective*

(of a person, action, or motive)
lacking consideration for other people:

concerned chiefly with one's own
personal profit or pleasure:

I joined them for selfish reasons.

adjective<

SELFISH

the fundamental behaviour of a gene to ensure its survival, whatever it takes:

the exact opposite to altruism:

The gene is the basic unit of selfishness.

collapse.

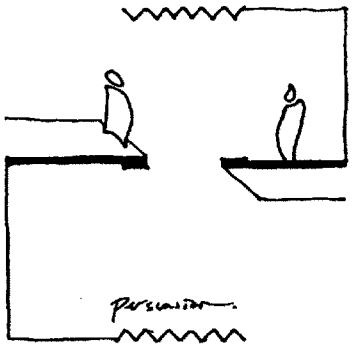
assuring survival

ABSTRACT

What is Selfish Architecture?

Selfish Architecture is, in effect, the genetic analogy to cultural dissemination - selection, variation, and replication - an extended phenotype of architectural memes. In genetics, phenotypic effects result from a combination of genes and their environment. An extended phenotype, as first discussed by Dawkins and Dennett, is the bodily manifestation of a gene: the effect that a gene, in comparison with its alleles, has on the body via development. Therefore, memetic phenotypes, or memeotypes, exist as active copies of external representations in culture (like art, architecture, music etc...) and play an essential role in memetic replication and cultural evolution.

The following investigates a modern social attribution of Darwinian evolutionary theory into a platform for selfish architecture. That is to say, more specifically, an investigation of mimetic theory (Dawkins' *meme* as the social mirror to the evolutionary *gene*) and its possible authority over architectural processes in attributing *selfishness* as a *viable* operative design strategy.

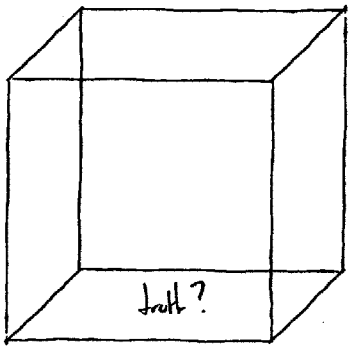


securing a selfplex

ACKNOWLEDGEMENTS

I would like to thank my advisor, Roger Connah, for framing my graduate experience far beyond the walls of the unspace/plagiat/archipuncture/agency studio. It has been an outright pleasure to co-evolve the Vertigo Anti-Library, Poetry Series, Memes 1 + 2, and all of the other sometimes insurmountable journeys we embarked on in Middle Earth. I hope this work successfully *closes it open.*

All of the time and devotion encapsulated within this thesis is dedicated to my wife, Brynne, with whom I have unearthed much, much more than a shared passion for architecture. Your limitless belief and encouragement has allowed me never to omit 'I.' Thank you for supporting a necessary rediscovery of my selfplex, especially as it continues to get lost from time to time.



the necker cube

INTRODUCTION

The phenotype is not limited to strictly biological processes, but by extension includes all of the effects on its environment. See Chapter Two.

Selfishness in evolution, as proposed by Richard Dawkins and as discussed by sociobiologists including Daniel Dennett and Susan Blackmore, among others, can be labeled as a view of unabashed advocacy towards a rather gene-centric analysis of society and, by extended phenotype, the realm of architecture.[1] This far-reaching statement, widely defended and argued within both scientific and religious circles, is perhaps too naïve and often limiting for observers. Nevertheless, as Dawkins effectively does, let us start by considering a helpful analogy he uses to situate the gene-centric position: the Necker Cube.

In fact, M.C. Escher's Waterfall, a classic example of impossible objects, was the first visual paradox I reproduced in Architecture School.

The Necker Cube is a well-known visual illusion among architects. It consists of a line drawing that the brain interprets as a three-dimensional cube. However, there are two possible orientations of the perceived cube, and both are equally compatible with the two-dimensional image on paper. We usually begin

by seeing one of the two orientations and, after a few seconds, the orientation 'flips over' in our mind, consenting the second view. A few more seconds and the image flips back, continuing to alternate as we look at the image.

The use of this analogy is to propose simply that there are multiple ways of assessing architecture, one no more correct than the other. As architecture becomes a field evermore dependent on interdisciplinary research, it is perhaps important to look at architectural approaches not as one more acceptable than the other, but rather as a simultaneous oscillation of views around the same problem. Therefore, the following analysis of the selfish virtue of architecture is not intended to validate a definitive direction of the profession or a view supplemented by proven theory, but rather presents simply a way of perceiving the illusion of architecture as dependent on the progression of means for its survival.

For a compelling argument on the dependance of architecture, refer to Part III of Jeremy Till's Architecture Depends.

The process to temporarily 'flip' the mind into this approach will navigate through theories of Darwinism & natural selection, genetic evolution, sociobiology, memetics, heretics, and mind viruses before examining their attribution into a platform of selfish architecture.

Notes

1 Dawkins, Richard. The Extended Phenotype: The Long Reach of the Gene. New York: Oxford University Press, 1999. p. 1.

SELFISH SELFISH

LIST OF ILLUSTRATIONS

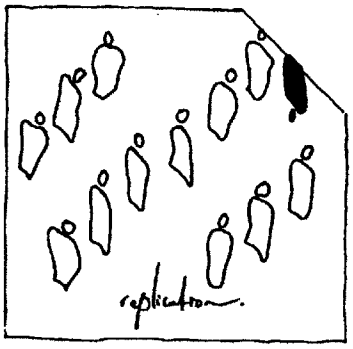
LIST OF TABLES

LIST OF APPENDICES

"*With long histories of negligible profit, and now unprecedented fuel costs, many airlines must face the truth that they should consolidate or die.*"*

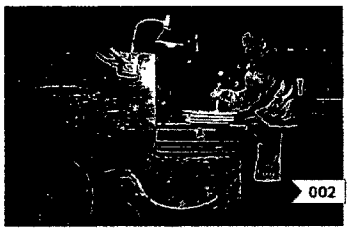
WILLIE WALSH
CEO of British Airways and Iberia.

* Walsh, Willie. "Surviving the Crisis." O'Connell, John F and George Williams. Air Transport in the 21st Century: Key Strategic Developments. Surrey: Ashgate, 2011. p. 55.



defining viability

CHAPTER ONE



For beautiful samples of the existence of some of the spaces, see Canadian-Armenian cinematographer Norayr Kasper's Still-Lives, a portrait series of aging soviet industrial sites on the brink of dissolution.

Nor, notably, a suppression of them.

Agents who act with, and on the behalf of, others. This idea is further detailed in various catalogued works published in Nishat Awan, Tatjana Schneider, and Jeremy Till's Spatial Agency: Other Ways of Doing Architecture.

Today it is perhaps easy to say that architecture is, on the whole, barely viable. As economies navigate through debt crises and their corporate structures collapse, merge, and sell their assets, the purpose-built facilities that house them are on the edge of being vacated, waiting to be re-inhabited and transformed into new working spaces. Other more typical, flexible-minded spaces have often become insufficient in providing the required specifics for their given program and are on a feverish cycle of either massive reconfiguration or attempting to compensate disgruntled occupants. This is not yet another youthful argument advocating sustainable, re-purposed architectures but rather poses the question as to why this situation exists in the first place and how, as agents, architects should bear more responsibility in enabling viable permanence in their work.

1.1 FIRMITAS

One of the earliest vocations of permanence in architecture can be traced back to the principles discussed by Vitruvius in his **Ten Books on Architecture**. Vitruvian permanence, or *firmitas*, is described as the stability or endurance of something without requiring excessive maintenance. In chapter five of his first book, Vitruvius describes his animate position towards choosing fit materials for construction while recounting the specifics an architect must be acquainted with when siting a town. He writes:

> *With regard to the material of which the actual wall should be constructed or finished, there can be no definite prescription, because we cannot obtain in all places the supplies that we desire. Dimension stone, flint, rubble, burnt or unburnt brick; use them as you find them. For it is not every neighbourhood or particular locality that can have a wall built of burnt brick like that at Babylon, where there was plenty of asphalt to take the place of lime and sand, and yet possibly each may be provided with materials of equal usefulness so that out of them a faultless wall may be built to last forever.*[1]

Although it is hardly conceivable to rely solely on found site materials for a project today, there is something to be considered about the prospect of faultlessness embedded within a well-chosen material. In fact, making suitable choices should at best not be strictly tied to material selection, but rather should fundamentally encompass all aspects including building methods, technique, and others. This level of suitability, or *fitness*, is key to defining the boundaries of viability in architecture.

However, this is an exceptionally viable option in most isolated pockets of habitation still found around the world. (Note The Second Promise: Shacklands thesis, specifically Uncle Tom's Cabin J.Armstrong 2012).

1.2 THE GOODNESS OF FIT

Architects strive for fitness. Endless hours are spent adding and subtracting, layering and blurring, hashing and re-hashing design solutions to hopefully land somewhere within the Goldilocks Zone of a just-right solution for a client. At times, perhaps more frequently than some would like to admit, the task of problem solving becomes so immersive that the result can often be much too abstracted or contextually insignificant to the original endeavour. A game develops where formal moves become less and less about direct reactions to site or program and instead transform into a conscious response to intuition or what simply feels right. After all, according to architect and theorist Christopher Alexander, "every design problem begins with an effort to achieve fitness between two entities: the form in question and its context."[2]

NASA's Goldilocks Zone, or the habitable zone, is defined as the right distance of a planet from a star to support life, perhaps the most elemental factor of defining viability.

(More about consciousness to follow in Chapter Three.)

Even without getting into the density of a formal exercise, one could prematurely assert that fitness of form is a contextual parameter of viability; it is fundamentally dependent on its judgment against a competing entity. Fitness is tied to a comparison of being unfit, or the suitable vs. unsuitable, moving on vs. being abandoned, evolving vs. regressing, living vs. dying... and so on. "The context and the form are complimentary."[3]

1.3 SURVIVAL OF THE FITTEST

The preservation of favourable individual differences and variations, and the destruction of those which are injurious, is what Darwin calls natural selection or the survival of the fittest.[4] This mantra, essential among the common discourse of evolutionary biologists, has heavily influenced the foundations of Darwinism and has spread to propose a delicate narrative for all of the intricacies of life as we know it. However, it is not strictly tied to evolutionary enquiries such as that of the genus *homo* by bioanthropologists, but has also become a suitable tool for predicting the general success that any endeavor may have.

Within the framework of architecture, it is easy to see how fitness defines the success of even the most modest of ideas. Look no further than a moderately profiled design competition and the cut-throat nature of the architectural spirit becomes evident. Here, survival depends not only on a suitable response to competition requirements but, more often than not, marks the blossoming of a new branch on Darwin's evolutionary tree. Successful schemes can even abandon injurious project brief requests in courtesy of elements more favourable to the overall intent, whether or not they were asked for -and budgeted for- in the first place. Typically, competitors respond but winners evolve.

Note the North American proposal model... fitness is defined even before the project starts.

Usually the added elements that helped the scheme win are the first to go under budget review - and often not to the surprise of the Architect.

1.4 VIABILITY

The term viability refers to achieving a heightened level of success or to the feasibility of a given variable. It is often used as criteria for risk evaluation and, if deemed unviable, abandonment and/or termination. In botany, the term describes the ability of a seed or spore to germinate. It shares relation in biology to the capability of a plant, animal or cell to survive or live successfully, especially under particular environmental conditions. Originating in the early 19th century, from the French *vie* and Latin *vita*, viability stems from life. In medical terms, the projected ability of a fetus or unborn child to live after birth is a factor in determining viable options for mothers experiencing difficult or unwanted pregnancies.[5]

Architect as a mother.
Frascari, Marco.

Architecturally speaking, the viability of a building should be an architect's top priority. The mother architect is, after all, incubating throughout the gestation of design until the eventual birth of her beautiful building - a creation that, after all of her care and devotion, she will most likely abandon and never revisit. Perhaps more important is the knowledge that at the moment of creation, she is responding to an instance in the evolution of dynamic relationships between groups of people with different visions of what the future is to be. While the siting of a building, its materials and their organization

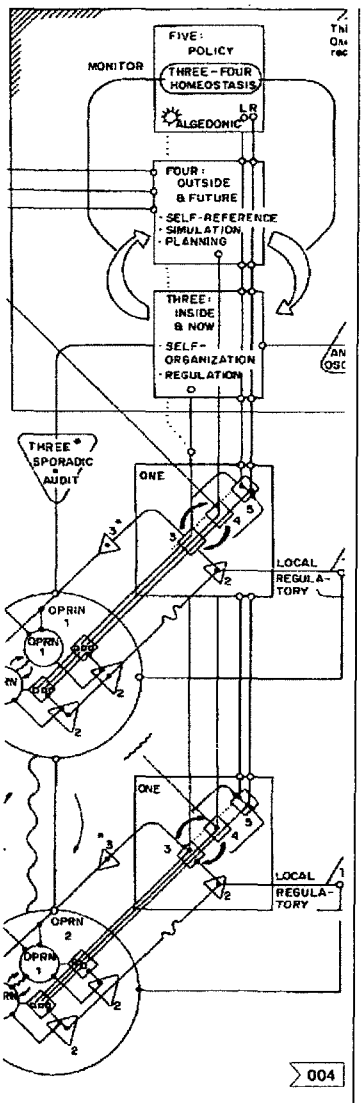
and the built space and form may have a particular meaning at the time they are conceived, that meaning may alter rapidly as circumstances change. These are impossible to predict. Despite this, the architect must, by fact of the physical reality of architecture, make decisions. In such cases, the architect exercises agency by selecting which future he or she hopes for, supports, or, perhaps, believes is most likely.[6] The architect must create a being "capable of independent existence."[7]

But how can we quantify this capability of autonomy? Is it possible to pre-code an entity to ensure its viability, whether it be strictly architecturally speaking or otherwise?

1.5 THE VIABLE SYSTEM MODEL

Perhaps an answer to these questions can be found within a model developed by British cybernetician Stafford Beer called the Viable System Model (VSM). The VSM is a model of the organizational structure of any autonomous or viable system; that is, a system that is organized to be able to survive in its changing environment. It "is not derived by analogy from the human central nervous system, but represents the isomorphisms which underlie any viable system, natural or artificial, biological or social."[8]

The VSM, in broad terms, is comprised of five



A detail of a schematic of the five systems within Beer's Viable System Model.

sub-systems that continually interact with each other, mapping the mathematical invariances in the management of complexity. These sub-systems, introduced in Beer's **Brain of the Firm**, can be briefly defined as follows:[9]

System One contains several primary activities, which are viable systems themselves. They perform functions that implement at least part of the key transformation of the organization.

System Two represents the recursive organizational structure for the information channels, resources and scheduling between the components of System One.

System Three identifies the structures and controls that are put into place to establish the rules, resources, rights and responsibilities of System One. It also provides interfacing between systems, representing the big picture view of the processes.

System Four is responsible for looking outwards to monitor how the organization needs to adapt to remain viable, identifying its purpose in relation to its environment.

Finally, System Five governs policy decisions within the system as a whole to balance demands and steer the organization, however arbitrary the boundaries may be.

1.6 AIRPORT VIABILITY

Let us change tack slightly and examine this system via an actual enterprise. In 2006, the Air Issues Task Force, a federal/provincial/territorial entity lead by Transportation Canada, completed a report on the viability of small airports in Canada. This report was in response to the Council of Ministers Responsible for Transportation and Highway Safety, who "agreed that the viability of small airports is a shared responsibility and that all partners would develop objective criteria and evaluation grids in order to determine the mission of small airports and identify options for future action."[10]

A mapping of the the NAS and small airports studied by Transportation Canada is offered in Appendix B.

The viability of small Canadian airports has been given particular attention since the induction of the National Airport System (NAS), defined under the National Airports Policy of 1994. The NAS is comprised of 26 airports that link the country coast to coast, including all national, provincial and territorial capitals, as well as airports with annual traffic of 200,000 passengers or more. "These airports reflect a commitment on the part of the federal government to the viability of a national system of safe, commercially-oriented and cost-effective airports."[11]

Airports not part of the NAS, at a staggering +/- 480 nationwide, have been federally abandoned and operate by a variety of other entities, including the

provincial, territorial, or municipal governments, airport commissions and private corporations. Many of these airports are in dire operating conditions, on the verge of abandonment and are therefore reasonably sited for a viability analysis within this thesis.

Notes

1 Vitruvius, Pollio. Ten Books on Architecture, Trans. Morris H. Morgan. New York: Courier Dover Publications, 1960. p. 24.
2 Alexander, Christopher. Notes on the Synthesis of Form. Cambridge: Harvard University Press, 1968. p. 15.
3 Alexander. p. 21.
4 Darwin, Charles. The Origin of Species. New York: P.F Collier & Son Company, 1909. p. 94.
5 Oxford Dictionary of English. Edited by Angus Stevenson. Oxford University Press, 2010. Oxford Reference Online. Carleton University. 08 Dec 2011 <http://www.oxfordreference.com/views/ENTRY.html?subview=Main&entry=t140.e0926460>.
6 Findley, Lisa. Building Change: Architecture, Politics and Cultural Agency. Taylor & Francis, 2005. p. 207.
7 Beer, Stafford. "The Viable System Model: Its Provenance, Development, Methodology and Pathology." The Journal of the Operational Research Society, Vol. 35 no. 1, 1984. p. 7.
8 Espejo, Raul and Roger Harnden. The Viable System Model: Interpretations and Applications of Stafford Beer's VSM. Chichester: John Wiley & Sons Ltd, 1989. p. 2.
9 Beer, Stafford. The Brain of the Firm. Chichester: John Wiley & Sons Ltd, 1981.
10 Air Issues Task Force. Study of the Viability of Smaller Canadian Airports. Ottawa, Transport Canada, 2006.
11 "National Airports Policy". Transport Canada. 03 Feb 2010, 09 Feb 2012. <http://www.tc.gc.ca/eng/programs/airports-policy-nas-1129.htm>.

$$\text{POWER OF A THEORY} = \frac{\text{NUMBER OF THINGS IT EXPLAINS}}{\text{NUMBER OF THINGS IT NEEDS TO ASSUME}}$$

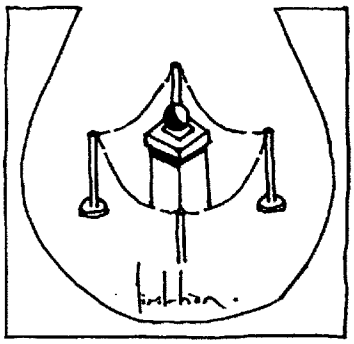
"*By this measure, Darwin discovered what may be the most powerful theory in all of science:*

$$\text{POWER OF DARWIN'S THEORY} = \frac{\text{A BILLION WELL-ADAPTED SPECIES}}{\text{GENES EXIST}}$$

... for mutation, competition, selection and evolution follow inevitably from the existence of high-fidelity replicators."*

RICHARD DAWKINS
Evolutionary Biologist.

* Dawkins, Richard. Published in Obrist, Hans-Ulrich. Formulas For Now. New York: Thames & Hudson, 2008. p. 37



hijacking darwinism

CHAPTER TWO

It could be said that architecture is perhaps, if anything, a field of relatedness. That is to say, more specifically, that it most always shares a kin relationship with its influences, whether they be directly embodied or more figuratively jaunted. Working within this shared *kinship* can allow designers to evaluate and re-evaluate their processes against pre-existing conditions or parented notions of value. However, this safety net can be often stretched much too thin, becoming a point of reliance rather than relation for designers. In turn, designers continually challenge to commandeer other fields, settling to practice somewhere between architecture and everything else. The practice of hijacking for architects has become so intriguing that some even hijack within their own field.

For more about architecture and its expanded field, see Esther Choi and Marrikka Trotter's Architecture at the Edge of Everything Else.

See the Circle Line Parties organized by Space Hijackers, a UK 'anarchitect' group that specializes in the covert overtaking of public spaces. Here, a party on the London Underground complete with DJ's, drinks, and disco balls.

This chapter is dedicated to examining the hijacking of Darwinism by sociobiologists, with the specific

goal of trying to describe how architecture can evolve as a social endeavor based on evolutionary theory. This should help determine why there could be a genetic predisposition for architecture to want to survive and, therefore, may need to act selfishly to do so.

2.1 NATURAL SELECTION

To begin a discussion that always behaves self-referentially to genetics, one must first understand the theory upon which a large school of evolutionary thinking is based: Charles Darwin's theory of natural selection.

The concept is simple but powerful: individuals best adapted to their environment are more likely to reproduce and therefore survive. As long as there is some variation between them, there will be an inevitable selection of individuals with the most advantageous variations to carry a species through generations. If the variations are inherited, then differential reproductive success will lead to a progressive evolution of a particular group of a species. This leads to groups that evolve to be sufficiently different, eventually becoming different species.

Darwin best describes his fundamental evolutionary theory early in the fourth chapter of his book, On

the Origin of Species, as follows:

> *"Let it be borne in mind how infinitely complex and close-fitting are the mutual relations of all organic beings to each other and to their physical conditions of life. Can it, then, be thought improbable, seeing that variations useful to man have undoubtedly occurred, that other variations useful in some way to each being in the great and complex battle of life should sometimes occur in the course of thousands of generations?*
> *If such do occur, can we doubt (remembering that many more individuals are born than can possibly survive) that individuals having any advantage, however slight, over others, would have the best chance of surviving and of procreating their kind? On the other hand, we may feel sure that any variation in the least degree injurious would be rigidly destroyed. This preservation of favorable variations and the rejection of injurious variations I call Natural Selection."*[1]

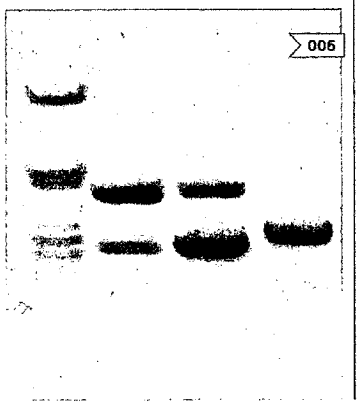
Although Darwin later refines his theory in much clearer detail, it is interesting to read his first explanation of natural selection as a theory somewhat reliant on chance. He validates his theory simply by arguing that, becuase scientists have sometimes observed characteristics seemingly beneficial to a species, that logically these attributes have assisted in the survival of and eventual evolution of said species, all without necessarily knowing *how* or *why* said traits were attributed in the first place.

Richard Dawkins, through the main argument of his work in **The Selfish Gene** and **The Extended Phenotype**, is in complete concurrence with Darwin's theory of natural selection as the definitive evolutionary model. However, Dawkins attributes all processes that both encourage and inhibit evolution through natural

selection not on chance, but rather believes that evolution is, at its core, of genetic basis.

2.2 GENETICS

Before discussing Dawkins' rather clever attribution of *selfish* behavior in genetic evolution, it is important to understand some of the basic structure and nomenclature familiar to genetics. Much of what we know about human deoxyribonucleic acid (DNA) is found through a process called electrophoresis.



A genetic sequence represented via electrophoresis.

Essentially, every cell in the human body holds copies of our DNA, containing 46 select chromosomes, half of which come from each parent. In this process, the DNA is spun and unwound, so as to dissect each chromosome for analysis. Each chromosome, represented by a vertical sequence of blots is then suspended in a conductive gel and charged electrically. With dye added, elements along each chromosome begin to glow. These elements are *genes*. The intensity of the rarefaction of each gene, in comparison to known intensities suspended in the same gel, allow a geneticist to determine which genes are present, and in what sequence. A difference of the sequence, an *allele*, can also exist. Finally, the observable characteristics, or what the gene does is called a *phenotype*.

Dawkins' definition of a gene, with medical basis, is however not quite as technical. He uses the word gene to mean "a genetic unit that is small enough to last for a large number of generations and to be distributed around in the form of many copies."[2] Dawkins' gene is a unit that is just large enough to create a phenotype influential to evolution: the gene as the fundamental unit of natural selection.

Dawkins coined the term *selfish gene* as a way of expressing his genetic view of evolution as opposed to Darwin's theory focused on the organism and the group. Essentially, for Dawkins, if two individuals are genetically related, the more sense -at the level of the genes- it makes for them to behave selflessly with one another. A gene, as the unit of natural selection, will behave in whatever way reasonable to ensure its survival and an ability to reproduce. In describing genes as being selfish, Dawkins does not intend to imply that they are driven by any motives or will - merely that their effects can be accurately described as if they were. According to Dawkins, this view explains altruism at the individual level in nature, especially in kin relationships: when an individual sacrifices its own life to protect the lives of kin, it is acting in the interest of its own genes.

Viability, as defined in Chapter One, is key to achieving this.

For convenience, Dawkins uses an *index of relatedness* to describe altruistic genetic behavior.[3] This index directly responds to the amount of genetic copies the individuals share. A parent, for example, will behave more altruistically to its child than it would to a grandchild because its degree of relatedness to the child is always 1:2, where to the grandchild is 1:4. This is because the parent has passed half of his/her genes to the child, and one quarter to the grandchild. An altruistic behavior imparted on the child, according to Dawkins, could therefore still be considered selfish as the parent is acting only in the interest of its genetic survival.

For Dawkins, all organisms are therefore acting solely on the premise of their genetic survival. We are gene machines: organisms built solely for the transmission of genetic information. This theory is helped by understanding evolutionarily stable strategies.

2.3 STRATEGIES

An evolutionarily stable strategy, or ESS, is defined as a strategy which, if most members of a population adopt it, cannot be bettered by an alternative strategy.[4] It is a subtle and important idea, first proposed by John Maynard Smith in his book of essays entitled **On Evolution**, but Dawkins describes it well as follows:

> *"Another way of putting it is to say that the best strategy for an individual depends on what the majority of the population are doing. Since the rest of the population consists of individuals, each one trying to maximize his own success, the only strategy that persists will be one which, once evolved, cannot be bettered by any deviant individual. Following a major environmental change there may be a brief period of evolutionary instability, perhaps even oscillation in the population. But once an ESS is achieved it will stay: selection will penalize deviation from it."*[5]

ESS's are an important concept in evolutionary genetics because they can help define animal behavior, excluding social elements often observed by zoologists. Strategies, adopted again purely by the selfish nature of the gene to ensure its survival, can enable different behavioral ecologies within social circles. Moreover, when examining the behavioral ecologies of humans, evolutionarily stable strategies are the gateway to understanding how ideas disseminate in society, striving for their own survival. One could argue that this in fact is architecture: a constant struggle for the dissemination of ideas into culture. Discussing the meme will help this transition.

Not only supported by the manifestation of these ideas into built, real-life experiences, but also by the glossy covers of countless architecture + design magazines found at any local newsstand.

2.4 MEMETICS

A *meme*, coined by Dawkins, is considered the social analogy to the evolutionary gene. The new soup, previously the gene pool, is the soup of human culture. Memes are the new replicators. Examples of memes are tunes, ideas, catch phrases, clothes, fashions, and ways of making pots or of building

arches.[6] Just as genes spread themselves in the gene pool by leaping from body to body via the process of reproduction, so do memes spread themselves in the meme pool by leaping from brain to brain via the process of imitation. In architecture, a designer might see specific response to a problem she is facing in another building: a precedent. She may imitate that solution, or adapt it to suit her specific set of problems. She might also discover a general theme to which she references her design, which we call a concept. Much like genes, a meme is dependent on the replication, variation, and selection of its information (DNA) to be successful.

Gene-centric sociobiologists relying on Dawkins' attribution of the term, like Susan Blackmore in her book **The Meme Machine**, would argue that, much like species are machines for genetic transmission, we are also simply enablers of memetic transmission. The level of success of replication, variation or selection of a new meme is pre-coded into our minds, much like a computer-based chess player is pre-coded with algorithms for success prior to entering a chess match. Perhaps a more uplifting view for architects and creative professionals is that presented by philosopher Kate Distin in her literary retort **The Selfish Meme**, where she ties the level of success of a meme to both the phenotypic effect and cultural DNA, which she calls *representational content*.

For Distin, most of the validity of the memetic analogy to cultural dissemination - selection, variation, and replication - lies in the phenotypic effect of a meme. In genetics, phenotypic effects result from a combination of genes and their environment. Distin argues that the extended phenotype, as first discussed by Dawkins and Dennett, is the bodily manifestation of a gene: the effect that a gene, in comparison with its alleles, has on the body via development.[7] Therefore, memetic phenotypes, or memeotypes, exist as active copies of external representations in culture (like art, architecture, music etc...) and play an essential role in memetic replication and cultural evolution.

What is interesting in Distin's reassessment is how she argues that culture's development can be seen as both the result of memetic evolution and the product of human creativity. For Distin, memetic evolution is equally compatible with the view of humans as conscious and intelligent, disassociating herself from the belief that the memetic/genetic analogy simply defines human culture as the product of a mindless evolutionary algorithm. For Distin, the cultural manifestations of human creativity validate both intellectual autonomy and the attribution of genetic theory to cultural evolution.

2.5 HERETICS

For others, Darwinism and any genetic/memetic theory hijacked to describe the evolution of society is pure heresy, a view positioned against creationism and unnecessary in determining why we are the way we are. Noted moral philosopher Mary Midgley believes that the meaning behind all of these investigations is purely a human interest in purpose, both scientific and religious:

> *"It is plain that we would not be able to understand the living world around us at all if we did not think of many things in it as purposive - or, of course, if we were so lacking in purpose ourselves that we did not follow our thoughts through to their conclusion."*[8]

As defended via Dawkins in this chapter.

Is this why architects hijack other fields, and why selfishness is so intrinsic to creating viable architecture - to find purpose? And if so, is this pursuit a conscious one? These questions lead the discussion to the concept of consciousness and whether or not architects are, or should be, aware of the creative processes they claim to exploit.

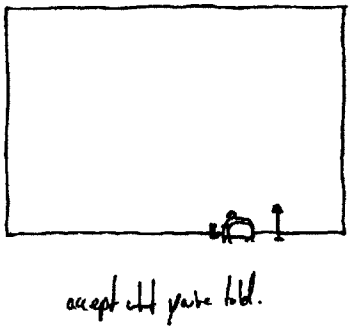
Notes

1 Darwin, Charles. On the Origin of Species, By Means of Natural Selection. London: Watts & Co., 1950. pp. 69-70.
2 Dawkins, Richard. The Selfish Gene, 30th Anniversary Edition. New York: Oxford University Press, 2006. p. 32.
3 Dawkins. pp. 90-108.
4 Dawkins. p. 69.
5 Dawkins. p. 69.
6 Dawkins. p. 192.
7 Distin, Kate. The Selfish Meme: A Critical Reassessment. London: Cambridge University Press, 2005. p. 28.
8 Midgley, Mary. The Solitary Self: Darwin and the Selfish Gene. Durham: Acumen, 2010. p. 112.

*"Everything you've seen is an illusion, it's a trick."**

EISENHEIM
Illusionist.

* Burger, Neil. The Illusionist, 2006. Film.



accept it if you're told.

the illusion of consciousness

CHAPTER THREE

Interest in consciousness is captured in Carlo Collodi's 1883 classic The Adventures of Pinocchio, where craftsman Geppetto famously creats the wooden puppet and dreams of it becoming a real boy. Above, the origianl artwork by Enrico Mazzanti(1883).

What is consciousness? This illusory state of being aware of our surroundings, who we are, and what we do is deeply rooted in the understanding of architects, neuroscientists and sociobiologists. Consciousness, or better yet, being conscious, allows us as creative individuals to assert why we think the way we think, draw the way we draw, and make the way we make. This feeling of intuition, however loosely defined, composes the primal reason of how the thoughts and ideas of the mind are transferred into external manifestations. However fundamental this concept may be, scientists have, to date, been unable to clearly define how consciousness exists, or where, if at all, consciousness is stored and developed in the human brain.

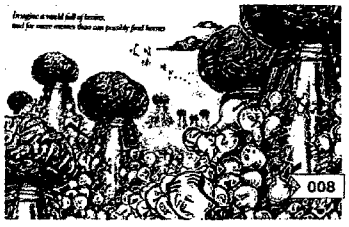
Is consciousness, therefore, an illusion?

The illusion that we are a conscious self having a stream of experiences is constructed, according to sociobiologist Susan Blackmore, "when memes compete for replication by human hosts."[1] To understand this statement, one must first take a cursory review of replication theories.

3.1 THE REPLICATOR

Memes, as introduced in Chapter Two, are defined as elements of culture that may be considered to be passed on by pseudo-genetic means. A meme is, in effect, the genetic analogy to cultural dissemination: the selection, variation, and replication of thought. First coined by Richard Dawkins in 1976, the meme (of the Ancient Greek **mīmēma**)[2] is a way of understanding the replication of ideas, behaviour or style as the social mirror of the evolutionary gene. When people copy actions or words, those actions or words are copied with variation and then selectively retained and replicated again. In other words, the actions and the words (the memes) fulfill the conditions for being a *replicator* in a Darwin-like evolutionary process.[3]

It is important, however, to identify the difference between memes and genes in that memes are not strictly replicators in the genetic sense. They certainly share the properties of inheritance,



See Susan Blackmore's 2008 TEDtalk about the possibility of even a third replicator, titled Memes and "Temes" (screencapture above)

mutation and selection with genes, but memes do not copy themselves perfectly.[4] There has in fact been considerable debate among sociobiologists about the extent of fidelity within memetic replication. Let us agree, for the purpose of this argument, that memes do replicate, but do so with some sort of attached mutation formed from the host's interpretation.

3.2 THE SWIMMING POOL

If we apply evolutionary theory to the memetic processes within the brain, assuming that something within it is somehow accountable for selecting, varying and replicating a virulent meme, we can conclude that these processes heavily influence how we experience the world around us. A memetic drive can exist, allowing the brain to effectively change its selective environment based on successful memes. This environment, or *meme pool* -to continue the genetic parallel with the *gene pool*- exists both inside and outside of the brain and consists of a massive throng of competing memes, all fighting against each other for the sole purpose of replicating, becoming the possible *fount*, or source of a new paradigm.

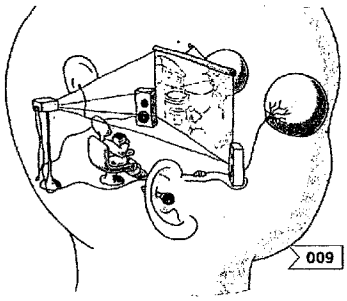
Architecturally speaking, this activity is a suitable descriptor of the design process. Although countless memes may filter through an architect's consciousness

every day when designing and problem solving, in the end we can agree that certain memes get selected over others because it is more viable.

Most likely because it has a higher fitness, as defined in Chapter One.

3.3 THE MEME MACHINE

All of this is to say, with some credibility, that the brain is somehow responsible, through the processing of memes, in alluding to a selective form of consciousness. Human consciousness, as Blackmore suggests, is no more than the processing of memetic information through a Meme Machine.[5] Some believe, within this machine we call the human brain, a space or state may exist where all of the sensory data collected by the extensions of the machine (the body) is analyzed. This is exactly the Cartesian Theatre envisioned by philosopher and cognitive scientist Daniel Dennett to explain how objects and experiences might be presented to a theoretical observer in the brain. Imagine a space, almost like a "Theatre of the Mind", where all of this information is gathered, assembled, and displayed in some way for processing: stereostopic projections filmed through our eyes are displayed on a seamless periphery screen in front; auditory speakers scattered to the left and right, hinting spatial cues and absorbed sounds; and touch, taste and smell sensors infuse collected data through neural cables and electrodes.[6] Who, or what, therefore, is sitting in the only coveted seat in the



Dennett's Cartesian Theatre.

house, experiencing the sights, sounds and incoming sensorial information? Could there be a figurative self inside the brain? Or, perhaps, some false notion of self?

3.4 THE SELFPLEX

This illusory self, or the acquisition of an illusion of self, is called a *selfplex*. Selfplex creation, according to Blackmore, is the root of consciousness, where the complex 'I' is formed in the human brain:

> *"The word 'I' is initially essential to distinguish one physical person from another, but very rapidly becomes used to say things like 'I think', 'I like', 'I want', 'I believe', 'that's mine' and so forth, as though there were a central self who has opinions, desires and possessions. In this way, I suggest, a false notion of self is constructed."* [7]

Obviously, saying a sentence such as 'I believe x' is more likely to get 'x' replicated than simply saying 'x'. This viral nature of belief is, according to some atheists like Richard Brodie, is the primal link to why religion is nothing more than a cult mind virus.[8] Without getting into religious debate, let us agree that securing a selfplex allows us to assert a power over the memetic processes we experience, whether or not we truly believe it or simply treat "I" as an illusion.

See Chapter Four for more discussion about this.

3.5 THE GRAND ILLUSION

Which the Oxford English Dictionary defines as the "misinterpreted perception of a sensory experience." [9]

To sum up, to say that consciousness is an illusion is to say, simply, that it is not what it appears to be. Memes, through the process of selection, variation and replication carried out by the intangibilities of the human brain, distort consciousness into an illusion rather than constitute it. What is important, in evaluating consciousness' parallel into architectural viability, is that being aware of memetic processes as they happen allows the architect to act appropriately. Even if efforts are intentionally more illusory than authentic, being conscious of the process is a selfish way of ensuring viability.

Notes

1 Blackmore, Susan. "Consciousness in Meme Machines." Journal of Consciousness Studies 10: No. 4-5, 2003. p. 19.
2 Dawkins, Richard. The Selfish Gene, 30th Anniversary Edition. New York: Oxford University Press, 2006. p. 192.
3 Dawkins.
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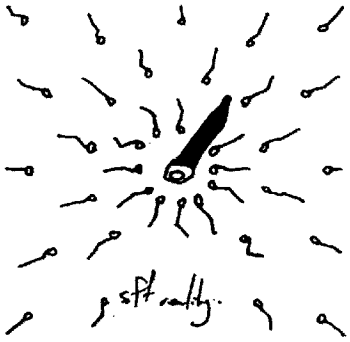
5 Blackmore, Susan. The Meme Machine. New York: Oxford University Press, 1999.
6 Blackmore, Susan. Consciousness: A Very Short Introduction. New York: Oxford University Press, 2005.
7 Blackmore, 2003. p. 25
8 Brodie, Richard. Viruses of the Mind: The New Science of the Meme, 5th Edition. New York: Hay House Inc, 2011.
9 Oxford Dictionary of English. Edited by Angus Stevenson. Oxford University Press, 2010. Oxford Reference Online. Carleton University. 07 Feb 2012 <http://www.oxfordreference.com/views/ENTRY.html?subview=Main&entry=t140.e0400400>.

"*It's figuring us out faster than we're figuring it out.*"*

DR. ALLEY HEXTALL
Scientist, Center for Disease Control.

* Soderbergh, Steven. Contagion, 2011. Film.



infected: how to catch a mind virus

CHAPTER FOUR

A virus acts like a small, infectious agent; the perfect replicator with a contingent crux on its ability to solicit some kind of host to take advantage of. Once a term reserved for scientific inquiry, *going viral* has evolved into a socially shared expression to describe the explosive popularity of news headlines, political doctrines, and even comedy gags. These mind viruses are conventionally caught via the vast proliferation of *tweets*, *likes*, and *pings* of the many social networking platforms that have slowly crowded our inboxes. The trials built to fight digital infection, like malware detection software and internet security protocols, are now easily circumvented via one click of the notorious 'share' button; the new syringe teeming with information and waiting to pierce fresh skin.

The main utilities of Twitter, Facebook, and Apple iTunes social networks.

Unfortunately, this is not the most frightening part. What follows is a strict jab against our collective consciousness: these infections have become so implanted that they can even predict new memes poised for our consumption without our consent. Google now uses search queries and browser history to bombard users with quasi-related advertisements across all of its platforms. Apple's iTunes can recommend music based on the content of an existing media library, or the library of others with whom share interest in a few songs or artists. Does the 'cloud', as a result of these infections, know more about ourselves than we do? And if so, does that matter? These infections do, after all, allegedly make life easier.

In order to ensure a virus' survival, it needs to secure a method of penetration, a way of reproducing itself faithfully, and a means of spreading itself to other minds.[1] These three requirements are essential towards an understanding why viral infections are important, as well as helping us make the jump from biology, through the mind, and into architecture.

4.1 INFECTION

According to Richard Brodie, original creator of the word processor Microsoft Word and author of **Virus of the Mind: the New Science of the Meme**, the first step in passing an idea is through some form of

penetration, or infection of the *host*. The severity, or virulence, of the infection creates a parasite-induced loss of fitness in the host and allows new programming to take place. Advertizers manipulate people using memes and genetic buttons by "... enter[ing] our minds without our permission. They become part of our mental programming and influence our lives without our even being aware of it."[2]

Infection, according to Brodie, can happen in three ways. First, infection is best achieved by implanting association memes through what is called conditioning, or sequential repetition. This works very well for advertisement campaigns or learning a new language, where we understand best by experiencing something and then repeating that experience multiple times until it is fully engrained in our mind. This is a strategy well-used by Coca-Cola, where not only their classic logo is identifiable around the world but even the Coke Red goes synonymously with their 81-year link to their first depiction of a red-suited Santa Claus in magazine ads in 1931.

Santa Claus enjoying a refreshing bottle of Coke in Coca Cola's 1931 Christmas campaign.

The second way is through cognitive dissonance, by taking advantage of the problem solving capacities of the brain. Here, when the brain is confronted with a problem or something it does not understand, it

For a thrilling sample of cognitive dissonance, see Christopher Nolan's 2010 film Inception, where dream architect Dominic Cobb and his team try to embed an idea into Robert Fisher's mind - making sure Fisher thinks the idea came from himself.

tries to make sense of it, and often creates a new idea that is then implanted in the brain. A friend, for example, is upset with me, and I try to reason why: *Did I forget the book she lent me? No, she said I could keep it as long as I needed. But she is finishing her research on mental triggers... I'd better bring it tomorrow...* and the new meme *'bring the book tomorrow'* is formed. This method is highly successful because it is the host itself that is coming up with the new mind virus.

See H.G. Wells' The War of the Worlds, where the only way the Earth is spared from a full Martian invasion is by contracting microbial infections to which they have no immunity, since "there are no bacteria on Mars."

Lastly, according to Brodie, viruses infect us by taking advantage of our *genetic buttons*, meaning danger, food and sex. These *Trojan horses*, even the most nascent or corrupt of viruses, have a high probability of taking at least some of our attention if they trigger one or more of these buttons.

No matter what the method of infection, it is important to note that viruses have figured out how continually infect us, and with little effort at that.

4.2 ENCAPSULATION

It is also important to mention that viruses are not all bad. Although the negative connotation usually persists, viruses serve as a tried and true vehicle for fighting other diseases. In 1796, for example, Edward Jenner noticed that milkmaids who

caught the cowpox virus did not ever get the deadly smallpox virus, and therefore developed a method to infect people with the more benign virus. This discovery heavily influenced modern medicine and the development of vaccinations.

This vehicular exhibition, the fact that viruses carry information, has immediate links to the propagation of concepts and ideologies in architecture. Imagine, as mathematician and architectural theorist Nikos Salingaros would, that all of the major movements throughout architectural history are nothing more than viruses of the mind: small experiments that, after being copied and adapted by various hosts -architects- over various instances -projects-, a stable entity is formed and recognized as 'Modernism' or 'Deconstructivism.' These entities, as defined in Chapter Two, can be called memes and look for ways to boost their opportunities of passing the information they carry. The meme is picked up by artists, poets, furniture designers, dancers, and *goes viral*.

This polite, logical system seems like natural selection at its best. However, not all memes play nice. One way a meme boosts its virulence is by linking itself to other attractive memes, which then shield the intent of the original meme and avoids the original meme being rejected by the

host.[3] In biology, a virus remains infectious against the continuous development of antibodies by host organisms by changing its encapsulation so the host no longer recognizes it. Salingaros argues, perhaps a bit facetiously, that Modernism went viral and its memes survived as long as they did because they were encapsulated. The table below shows a list of some of these memes.

Table 1

ENCAPSULATIONS FOR MODERNIST MEMES	
1	"progress and economic prosperity from technology;"
2	"freedom from class opression through new design;"
3	"social equality and houring opportunities for all;"
4	"moral superiority from using honest materials;"
5	"improved health + hygiene through smooth surfaces;"
6	"the mathematical principles of pure form;"
7	"cost benefits resulting from modular production;"
8	"design that expresses the spirit of the age;"

Salingaros claims that Modernism's sleight-of-hand has lead to the predomination of the modernist style in architectural practice and schools. Although this claim seems rather hastily offered, it is clear that architectural memes carry embedded meaning and fight for systems to impart that meaning.[4] Perhaps that system is best explored via Salingaros' close

collaborator, architect and alternative theorist Christopher Alexander, in his development of A Pattern Language.

4.3 A PATTERN LANGUAGE

The Timeless Way of Building initiates a three-volume series by Alexander that identifies patterns, problems and solutions to the essence of various architectural issues, all which can be solved by ordinary people with ordinary intelligence. A Pattern Language has the structure of a network: a sequence that can generate infinite possibilities.[5] If described again via biological reference, it is a sequence of memes that have been unwrapped from their encapsulation and are immediately available for implantation into the host's mind. The result is a language that is no longer restricted to architects, but can be used by anyone. The self-sufficiency of a system is therefore key to its viability, and has been the goal of some architects dealing with very large buildings or complex programs. This is exactly what Jan Benthem discovered while working on Amsterdam's Schiphol airport over the last 30+ years.

4.4 ARCHITECTONIC DNA

In a recent interview for a film about Haarlemmermeer and Schiphol Airport, Benthem used the term *working with architectonic DNA* to refer to "a string

of information serving as the basis for [the] redesign and expansion of Schiphol Airport in the Netherlands."[6] Maintaining the use of this string of information has allowed all of the working parts within the complex to "have such a strong and self-sufficient character that the organism survives the modifications and exchanges of its vital parts without the use of life-supporting systems."[7] The entire complex is designed so that whenever an area has to be shut down for additions or renovations, the airport can still function normally. The organism seems to have achieved some sort of autonomy from its designers to allow it to live, not only after construction, but also during the design process. The coding of a system like this ensures autonomy from the designers' arbitrary decisions to fit into the overall organism or a final concept.

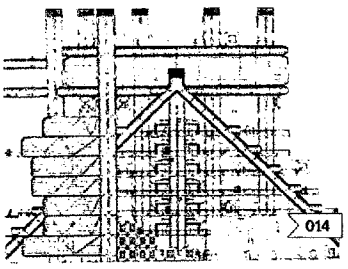
Or, rather, anti-architect as he might have claimed.

4.5 ARCHITECTURE AS A SYSTEM

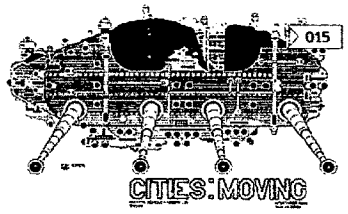
Autonomous systems like this in architecture are not uncommon. Cedric Price, architect of the un-built Fun Palace, "attempt[ed] to disavow architectural authorship" by designing an adaptable project that invited user participation.[8] Defining basic parameters for his system allowed the Fun Palace, theoretically, to operate like an organism hosting multiple competing memes of various program elements, each like viruses fighting to take hold of the

Cedric Price, Fun Palace.

structure and define what the building should be. Although the project was never built, it did inspire others like Richard Rogers and Renzo Piano in the design of the Centre Pompidou in Paris, 1971-1977. Other notable system-based architectures influenced by the popularity of cybernetics in the 1960's include works of Archigram like Peter Cook's Plug-In City and Ron Herron's Walking City.



Archigram's Plug-In City above and Walking City below.



All of these projects rely on a mega-structure to which cell-like genes/memes/viruses are hosted, preventing stagnation and promoting evolution within the architecture itself. As a viable model, thinking of architecture as an infection system is a good way to ensure that a building, and more importantly the occupants and functions housed within it, survive.

Notes

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2 Brodie. p. 126.
3 Salingaros, Nikos A. A Theory of Architecture. Solingen: Umbau-Verlag, 2006. p. 209.
4 Salingaros. p. 211.
5 Alexander, Christopher, Sara Ishikawa, Murray Silverstein with Max Jacobson, Ingrid Fiksdahl-King and Shlomo Angel. A Pattern Language: Towns, Buildings, Construction. New York: Oxford University Press, 1977. p. xviii.
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7 Temel, Robert. "Survival of the Fittest: A Biological Conception of the Architectural Project". Working With Architectonic DNA. Heijningen: Jap Sam Books, 2010. p. 42.
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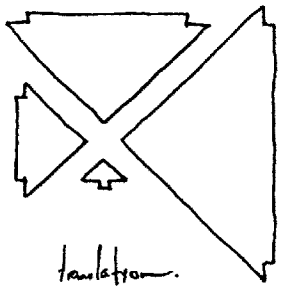
"*[A] new network architecture emerges, a delicate ghostlike trace that operates more as landscape than building.*"*

CEDRIC PRICE
Architect, describing the Fun Palace.

* Wigley, Mark. "The Architectural Brain." Published in Burke, Anthony and Terese Tierney. Network Practices: New Strategies in Architecture and Design. New York: Princeton Architectural Press, 2007. p. 42.



operators of selfish architecture

CHAPTER FIVE

So where does all of this lead us? The research and enquiries described throughout Chapters One, Two, Three and Four have resulted from a wide investigation of the social branches brought by Darwinian evolutionary theory. The target of this investigation, as stated in the abstract, is to test selfishness - via Dawkins' selfish gene - as a viable operative design strategy. This goal has lead to the development of five operators that may enable selfish architecture, or an architecture that has a built-in ability to do whatever it needs to in order to survive. These operators, when used together as a system, are seen as contributors to a viable incubator: a test tube for thinking and a territory for experimentation.

The operators will be described and tested as follows: replication, adaptation, kinship, consciousness and implantation.

5.1 REPLICATION

As learned in Chapter Three, developing a capable replicator is key to the successful transmission of information - whether they be labeled as genes, memes or something different altogether. A good architectural replicator, something that is easily copied while maintaining relatively high fidelity, can allow a building to be built faster, cheaper, and better by using repeating or modular, pre-fabricated components. Embracing successful architectural replicators also promotes the familiarity, consistency and reliability of previously tested ideas and allows users to immediately recognize how to navigate a space defined by said replicators.

Four examples of architectural replication, to be tested in the following project, include:

A. **A STRUCTURAL GRID**, which embraces a consistent system to support a Fun Palace-like invention and re-invention of programmed space;

B. **DOORS + THRESHOLDS**, when copied consistently, enable users to correctly navigate within and between spaces just as they do anywhere else;

C. **SIGNAGE**, while used graphically, supports an ease of navigation through a semi-chaotic, changing space; and

D. **STAIRS**, which respond to the pre-coded stride of users exhibiting different size, speed or direction.

5.2 ADAPTATION

The second key for a building's survival is its ability to adapt to change. Evolutionarily Stable Strategies, as discussed in Chapter Two, allow genes and memes to organize methods - while monitoring influences from its environment - to adjust their operation and ensure everything is working the way it should. Much like a species continually adapts to its changing environmental conditions, a selfish building could benefit from a similar strategy. Importantly, adaptation does not rely on the fitness of a single operator, but performs best as part of a system.

Four examples of architectural adaptation, to be tested in the following project, include:

A. **A SKIN**, one which can change or be modified depending on variances in environmental conditions;

B. **AN AIR SYSTEM**, that moderates between HVAC and user enabled or passive technologies to sufficiently control climate settings;

C. **CROSS-PROGRAMMING**, a space that functions quite readily under one program but is easily hijack-able for another purpose; and

D. **A NETWORKED SYSTEM**, allowing an expansion/ contraction or log on/off spatial scenario to anticipate change or evolution.

5.3 KINSHIP

Selfish architecture is an extended phenotype of architectural memes. From analyzing the phenotype - the observable characteristics of a gene - it is immediately evident that there is a strong relationship between a meme and the manifestation of that meme. The two are linked together. This relational condition shares a similarity to the concept of kinship discussed in Chapter Two. Architecturally speaking, one might identify this relationship as the waiting room scenario: where one space - the waiting room - exists only because of its relationship to the *other* space. A co-dependence secures the need for both spaces, increasing the chances of survival.

Four examples of architectural kinship, to be tested in the following project, include:

A. **A WAITING AREA**, a conditional space that secures a need for both it and the space or event it is waiting for;

B. **A MATERIAL CHOICE**, which, by building with one material, secures the need to use a second material dependent on the first;

C. **A COMMON SPACE**, acting like a buffer between spaces that should not be in relation by creating a third, shared space; and

D. **GLASS**, promoting a consistent visual relationship for users to spaces they have come from and others they are going to.

5.4 CONSCIOUSNESS

The fourth operator of selfish architecture stems from the illusion of consciousness discussed in Chapter Three. As discussed, memes distort consciousness into an illusion rather than constitute it via the process of selection, variation and replication carried out by the intangibilities of the human brain. Architectural consciousness - being fully aware of all methods within the architect's realm - promotes highly considerate and more suitable responses to both direct and indirect emergent issues. Even if efforts are intentionally more illusory than authentic, being conscious of the process is a selfish way of ensuring viability.

Four examples of architectural consciousness, to be tested in the following project, include:

A. **A VIEWING PLATFORM**, a space for users to monitor and be aware of functions happening both inside and outside;

B. **A TRUTHFUL MATERIAL**, if personified, displays an embedded selfplex, or rather knows what it is and is not fake in any way;

C. **A SENSORY SPACE**, drawing similarity to a Theatre of the Mind, where all of the users senses are stimulated; and

D. **A SIMPLE DETAIL**, which humbly and elegantly performs its purpose, knowing exactly what it is and assumes nothing more.

5.5 IMPLANTATION

Lastly, the survival of a competing architectural idea, as seen in Chapter Four, is heavily contingent on the virulence of its memes. Their capacity of infection and their ability to pass their representational content to their host - whether it be figuratively into the user's mind via experience or physically within the architecture itself - can impart a memory encapsulated with embedded meaning to the user. A mind virus, implanted in this way, has a high chance to circulate to other hosts and may even go viral, increasing its likelihood to become autonomously viable. Let us call this operator architectural implantation.

Four examples of architectural implantation, to be tested in the following project, include:

A. **A FACADE**, or other system, that attaches to a host or structure and imparts representational content like sun and shade;

B. **AN ESTABLISHED LANGUAGE**, or brand, embodied consistently in architectural representation and can be copied to other media;

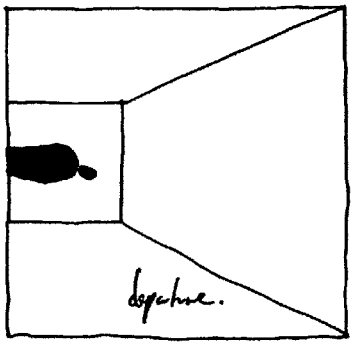
C. **AN AUTONOMOUS PROGRAM**, like an organism, which can survive modification without life supporting systems; and

D. **AN EMBODIED EXPERIENCE**, where users can unpack the encapsulated architectural memes and discover a deeper, perhaps personal meaning.

"*From the 1970's to the mid 1990's [...] airports had become places to get through, rather than be in.*".

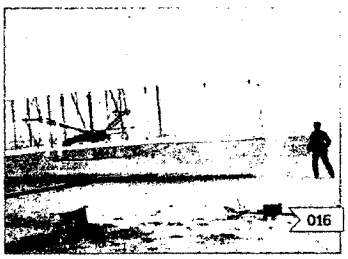
CURT FENTRESS
Fentress Architects.

* Fentress, Curt. 2011 Fentress Global Challenge. Competition Brief, 2011. p. 2.



airport of the future

CHAPTER SIX



On December 17, 1903, two brothers from Dayton, Ohio, named Wilbur and Orville Wright, were successful in flying an airplane they built. Their powered aircraft flew for 12 seconds above the sand dunes of Kitty Hawk, North Carolina, making them the first men to pilot a heavier-than-air machine that took off on its own power, remained under control, and sustained flight.

Airports have come a long way from the flat landing fields originally used by pioneers of flight like the Wright brothers Orville and Wilbur. Today, they have become vital hubs for moving people, goods and services - exploding the limits of frontiers. Airports no longer serve isolated functions: they now extend - and redefine - the metropolis.[1]

If we continue to use the memetic references upon which this thesis relies, one could consider the airport in general as a comprehensive structure of passing entities, information and ideas - a valid and functioning meme pool. Is the dilution of this meme pool, partly marked by the marginal profitability that has continually plagued airline managers for decades, a result of the meshing of once distinct markets via acculturation? Could airports benefit from a selfish system model? These questions mark our point of departure.

6.1 THE SHOPPING MALL

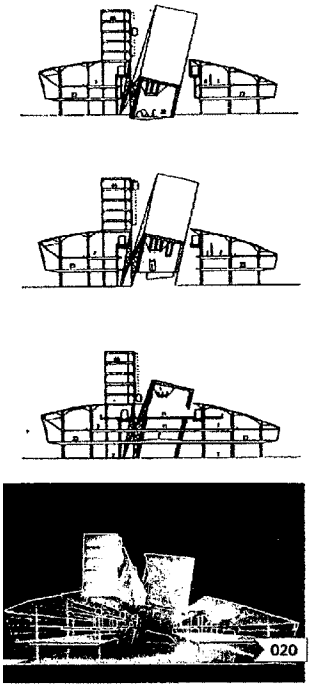
Like the recent multi-billion dollar expansion of LAX by Fentress Architects (above). Some of these malls are so incredible that one could even live in an airport, as Alain de Botton recently experienced at LHR's new Terminal 5 (below). Suddenly the adventure at JFK of expat Viktor Navorski, played by Tom Hanks in Steven Spielberg's 2004 film The Terminal, seems all too real (bottom).

With the exponential rise in fuel costs and other surcharges taking hold within the last decade, many airports are looking for ways to lower their operating costs and ensure their survival in some way. Some have succeeded in increasing revenues in part by leasing terminal space to various consumer amenities like duty-free shops, clothing and souvenir stores, bookstores and eateries. This logistic shift marks the transition of the once majestic and wondrous experience of mid-century flying into what could be classified as a shopping mall. Seen in many international airport terminals are arcades of never-ending retailers, punctured by throngs of travellers wondering how to busy themselves while waiting to for their flights.

Analyzing the shopping mall operational structure as a viable system, one could argue that several of the requirements contained in the Viable System Model (VSM) introduced in Chapter One are not met. For example, the primary activity of the system - the movement of passengers - is in itself not a contained, independent viable system as per System One. Passengers must pass through the shopping mall in order to get to their destination, a procession upon which the mall relies on for spontaneous revenues. Additionally, the mall is often not linked to any other systems within the airport complex, usually existing solely on the airside of security.

System Four of the VSM would require the mall to look outwards, monitor, and adapt itself depending on the requirements presented by other competing functions of the airport, rather than allotting a rigid secure area for shops within the mall - which at times can be substantially abandoned as the rent gets too steep for vendors.

6.2 EXPANDING THE EVENT



Sections through Tschumi's 1988 Kansai International Airport proposal, showing the double strip, the wave, and the slab.

An alternative model, proposed by some of the alternative architectural thinkers like Bernard Tschumi, embraces the roots of the airport as a place of wonder. Tschumi's 1988 proposal for Kansai International Airport remembers the airport as an event or spectacle - "a city of interchange and exchange, of business, commerce and culture."[2]

The design is divided into two parts, one built of a series of forms that houses all of the programs of the airport and another that extends the programs onto a shared deck. This proposal works well as a viable system, as the elements contained in the system act as generators; as catalysts for every kind of activity or function. "In these city-generators, functions and programs combine and intersect in an endless "disprogramming" or "crossprogramming."[3]

After analyzing a few larger airports, let us again change tack and study something closer to home.

6.3 AIR STATION/BASE/ PORT/MUSEUM

Air services at Rockcliffe share a long and varied history, mostly covering Canadian military initiatives. The first Crown interest in the site can be traced back to the 1890's, when the Dominion Government borrowed the name Rockcliffe from the neighbouring Rockcliffe Village and established the Rockcliffe Rifle Range to train militiamen. The low-lying, forested site was ideal and full of potential for the Department of Militia and Defence, with the limestone cliffs serving as natural gun butts. The area was firmly associated with guns and horses by the turn of the century.[4]

The site served as an adequate, albeit muddy, rifle range until the Royal Air Force started a trial airmail service, landing planes behind the range butts just after WWI. By 1922, the area was turned over to the military for the new Ottawa Air Station, followed by the formation of the Royal Canadian Air Force (RCAF) in 1924. Slowly, Rockcliffe began to develop as an air station, eventually becoming the second longest RCAF-associated air station in Canadian history.[5]

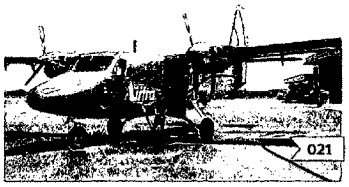
From the 1930's until the beginning of WWII, military flying at Rockcliffe consisted mainly of photographic survey work for the government, transporting personnel, and testing new aircraft.[6] The 1940's marked a significant training era for Allied forces

at Rockcliffe, including communications, fighter control, aircraft recognition and photography.[7] Aerial surveying of Canada's North became a major role for the RCAF after 1945 until 1957 when further survey requirements were taken over by other government departments.[8] In 1964, the RCAF ceased flying operations at Rockcliffe and many of its historical aircraft were moved to the abandoned hangars left on the site from WWII, creating the National Aeronautical Collection and the foundation for the present Canadian Aviation and Space Museum.[9]

Although the RCAF no longer flew from the airfield, it continued operation with the public use of the Rockcliffe Flying Club. As Rockcliffe Airport, it was also briefly used as a trial commuter air service to Montreal for short take-off and landing (STOL) aircraft in the mid 1970's.[10]

6.4 STOLPORT

The period of commercial flight in Rockcliffe's history is very brief, lasting only two years between 1974 and 1976 when the federal government directed the Ministry of Transport to plan, develop and evaluate a Canadian STOL commuter air system. The goal of this system was to provide fast, efficient business commuter services from city-centre to city-centre. Airtransit Canada - a subsidiary of Air



One of the six Airtransit DHC Twin Otters being refueled at Rockcliffe STOLport.

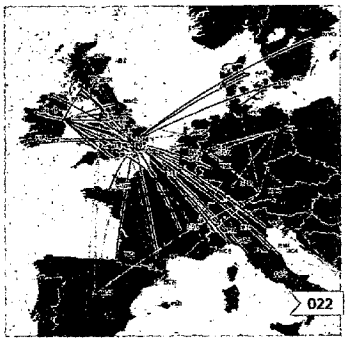
Canada - was formed to operate six de Havilland Canada Twin Otter Series 300's to fly hourly between Rockcliffe and a Montreal STOLport built on the site of the old Victoria Car Park used for Expo 67.[11]

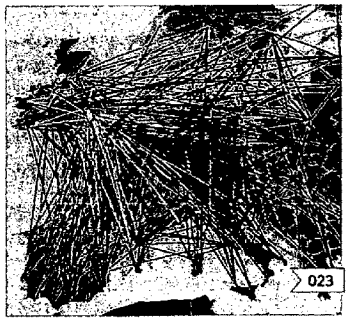
Initial indications showed that the STOL service was catching on among the business community. Most considered it a "... forward-looking vision, a technological triumph, and a success" but the fact that it never caught on called for some to label the entire exercise as "... a fraud, a delusion, and a disaster."[12] The Twin Otters carried a total of 157,700 passengers during its two-year service, over 50% more than other aircraft services combined during that time.[13]

Although interest in the service between Ottawa and Montreal subsided by the 1980's, it did pave the way for a no-frills, business-specific low-cost airline model that has demonstrated profitability today. Perhaps a few decades before its time, the STOL venture at Rockcliffe served as an excellent precedent for introducing a viable commuter air network.

6.5 BUDJETAIR

As stated, the valuable *fount* to come out of experimentations like that performed at Rockcliffe has been the explosion of the low-cost airline sector. Once treated solely as the discounted arm adopted by several major airlines around the world, the model has evolved over the last twenty years to include highly profitable stand-alone enterprises like Toronto-based Porter Airlines and Irish titan Ryanair.





The European low-cost carrier network in 2000 (above) and again in 2008 (below).

Ryanair carried over 66 million passengers in 2009/2010, in contrast to 5,000 in its first year of operation in 1985. Right now, it is the world's largest international airline and the innovative leader in the European low-cost sector. Its market capitalization at the end of the 2009/2010 fiscal year was €7.5 billion, more than twice that of British Airways.[14]

So what makes Ryanair so successful? The main reason is the simple product that the airline offers: the lowest fare with a lower cost base.[15] Ryanair abandons all of the customer service items typically offered by traditional airlines, in favour of a streamlined model embracing efficiency and a high productivity rate among employees. A summary of these services is shown in the table below.

Table 2

CUSTOMER SERVICE ITEMS DROPPED FROM THE TRADITIONAL EUROPEAN AIRLINE PRODUCT BY RYANAIR		
IN-FLIGHT SERVICE ITEMS	**AIRPORT SERVICE ITEMS**	**TICKET RESTRICTIONS**
No sweets, newspapers, free food or beverage service.	Secondary airports are typically served.	Tickets are not sold through travel agents nor through company retail ticket outlets.
No seat allocation.	No interlining or connecting journey tickets are issued.	No frequent flyer program.
No business class service.	Passengers and baggage must be checked in at each airport on a multi-sector journey.	Stricter penalties for "no show" passengers.
More seats per aircraft and a higher load factor.	No airport lounge service.	

Moreover, senior economics lecturer Dr. Sean D. Barrett of Trinity College Dublin, considered one of the foremost economists in Ireland, defines the future viability of Ryanair as dependent on three factors: "the views of passengers, how Ryanair organizes its production of air transport services, and the external operating environment's impact on the airline."[16] Reflecting back to the genetic simile used in Chapter Two, the views, organization and external environmental influences of the low-cost model anticipated by Barrett can serve, respectively, as the memes, DNA, and extended phenotypes exhibited

by a viable - or perhaps selfish - system.

Conclusively, the steady decline of the airline industry has moved to a distinct point of evolution. With most airlines observing record losses, the low-cost model has demonstrated viable profitability, independantly capable of surviving fluctuating markets and financial crisis. It is this model upon which the following project is based: a test for a low-cost commuter air venture at Rockcliffe Airport, aimed at maintaining the viability of the site.

Notes

1 Tschumi, Bernard. Event-Cities (Praxis). London: The MIT Press, 1994. p. 105.
2 Tschumi. p. 105
3 Tschumi. p. 102.
4 Payne, Stephen R. A History of the Rockcliffe Airport Site: Home of the National Aviation Museum, Ottawa, Canada. Ottawa: National Aviation Museum, 1999. p. 3.
5 Payne. p. 8.
6 Payne. p. 12.
7 Payne. p. 22.
8 Payne. p. 36.
9 Payne. p. 37.
10 Payne. p. 38.
11 The Airtransit Operation. FLIGHT International. November 28, 1974. p. 745. <www.flightglobal.com>.
12 Stevenson, Garth. The Politics of Canada's Airlines: From Diefenbaker to Mulroney. Toronto: University of Toronto Press, 1987. p. 110.
13 Canadian Air Transportation Administration. STOL and Short Haul Air Transportation in Canada. Ottawa: Transport Canada, 1978.
14 Barrett, Sean D. "Ryanair and the Low-cost Revolution." Air Transport in the 21st Century: Key Strategic Developments. Surrey: Ashgate, 2011. p. 113.
15 Barrett. p. 116.
16 Barrett. p. 125.

“If you look at it, we don't really need airports to do much any more. [The] airport terminal serves very few purposes any more, except that it is an international shopping center, owned and run by rich airports.” *

MICHAEL O'LEARY
CEO of Ryanair.

* Mann, Julliet. Ryanair CEO: Airports unnecessary "international shopping centres". CNN, Mar 15, 2012.

the landing strip

arrival.

CHAPTER SEVEN

To test the five operators of selfish architecture defined in Chapter Five - and determine if selfish architecture could be a viable operative design strategy - they need to be applied to the development of an architectural project. This marks the point of arrival for this thesis.

The following project proposes a new terminal/ public building and runway expansion at Rockcliffe Airport in Ottawa. The goal is to support a low-cost commercial commuter air service, cross-programmed with various publicly accessed, community-oriented initiatives to increase traffic and revenues to the site. The operators will be tested at both site/ program scale - macro - and building/detail scale - micro - to develop a viable system model that can help ensure the future survival of Rockcliffe Airport.

7.1 SITE

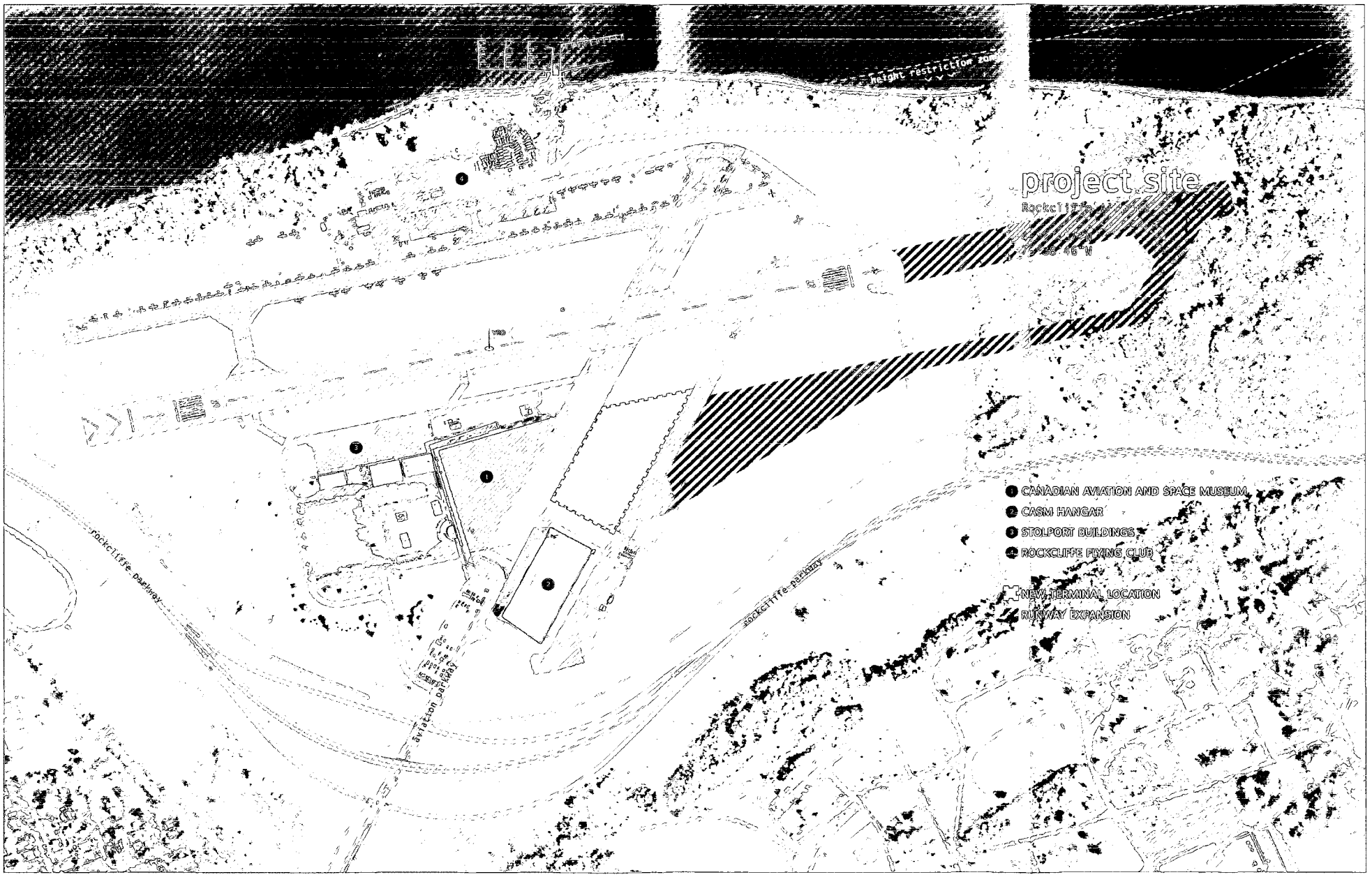
Rockcliffe Airport is located on the south shore of the Ottawa River, 4NM northeast of downtown Ottawa. It is the second largest airport within the National Capital Region, smaller only than the Ottawa Macdonald-Cartier International Airport located south of Ottawa. Both Crown-owned corporations and private stakeholders share the site, whose limits are defined by the Ottawa River to the north, Rockcliffe Parkway to the south, and National Capital Commission (NCC) lands to the east and west.

For a map of air services in the National Capital Region, see Appendix C.

In addition to the unique history outlined in Chapter Six, the site has been a steady home to the Canadian Aviation and Space Museum (CASM) and the Rockcliffe Flying Club (RCF) for most of the last half-century. Only one part of the former triangle of runways remains active today and is operated by the RCF.

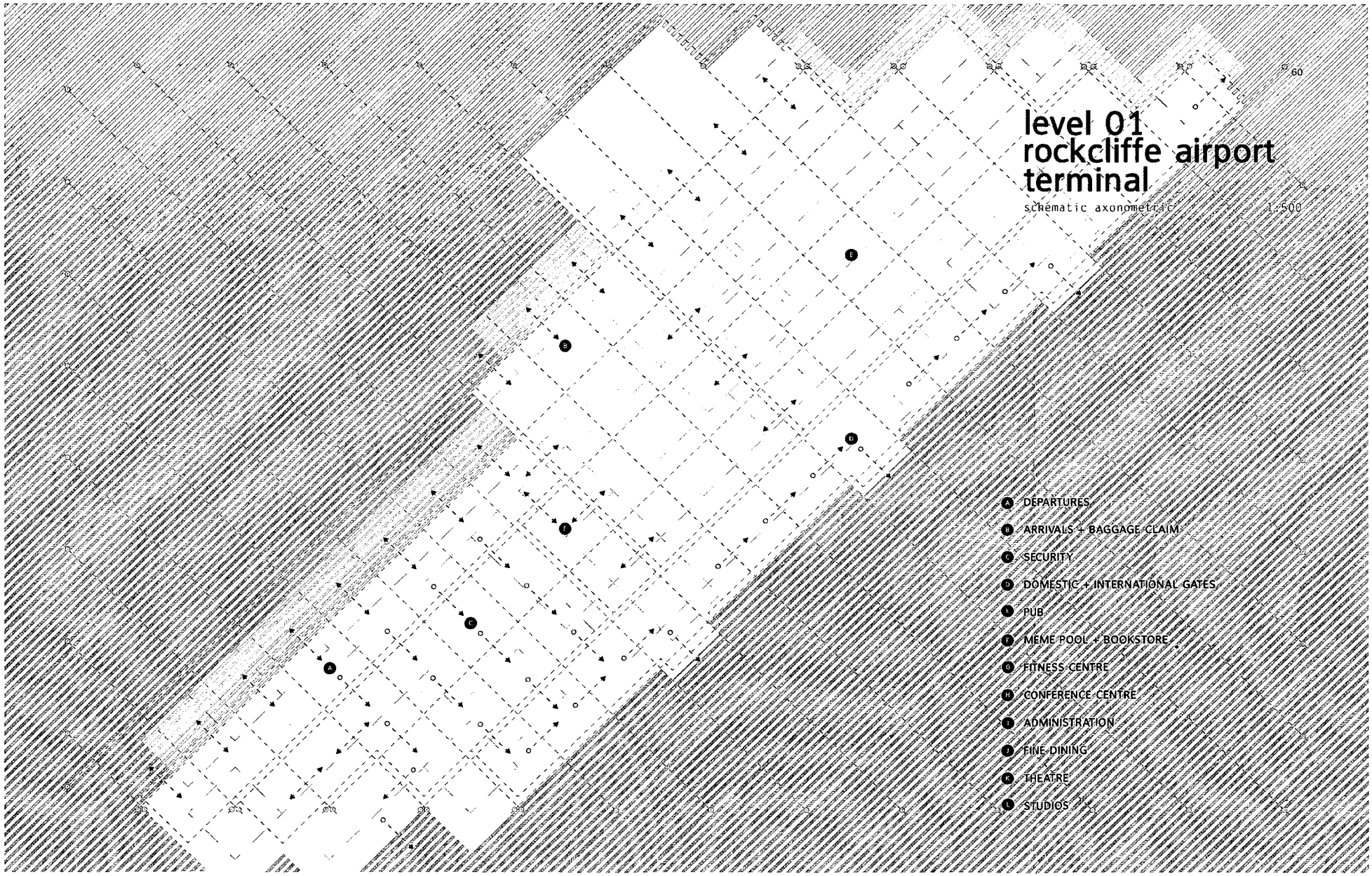
Although the CASM houses some of the most significant artifacts of Canada's aviation history, the visitor quota it once enjoyed post-jet age has been in steady decline. While recent expansions in 2006, 2008 and 2010 have created much-needed administrative and exhibition space, decreased financial support and public interest have meant increased challenges for those running the facility. This project proposal is therefore intended to increase the overall fitness of the site and help Rockcliffe Airport become a more viable, self-sustaining entity.

Including the original nose section of the Avro CF-105 Arrow.


project site
1 CANADIAN AVIATION AND SPACE MUSEUM
2 CASM HANGAR
3 STOLPORT BUILDINGS
4 ROCKCLIFFE FLYING CLUB
NEW TERMINAL LOCATION
RUNWAY EXPANSION
Rockcliffe Parkway
Aviation Parkway

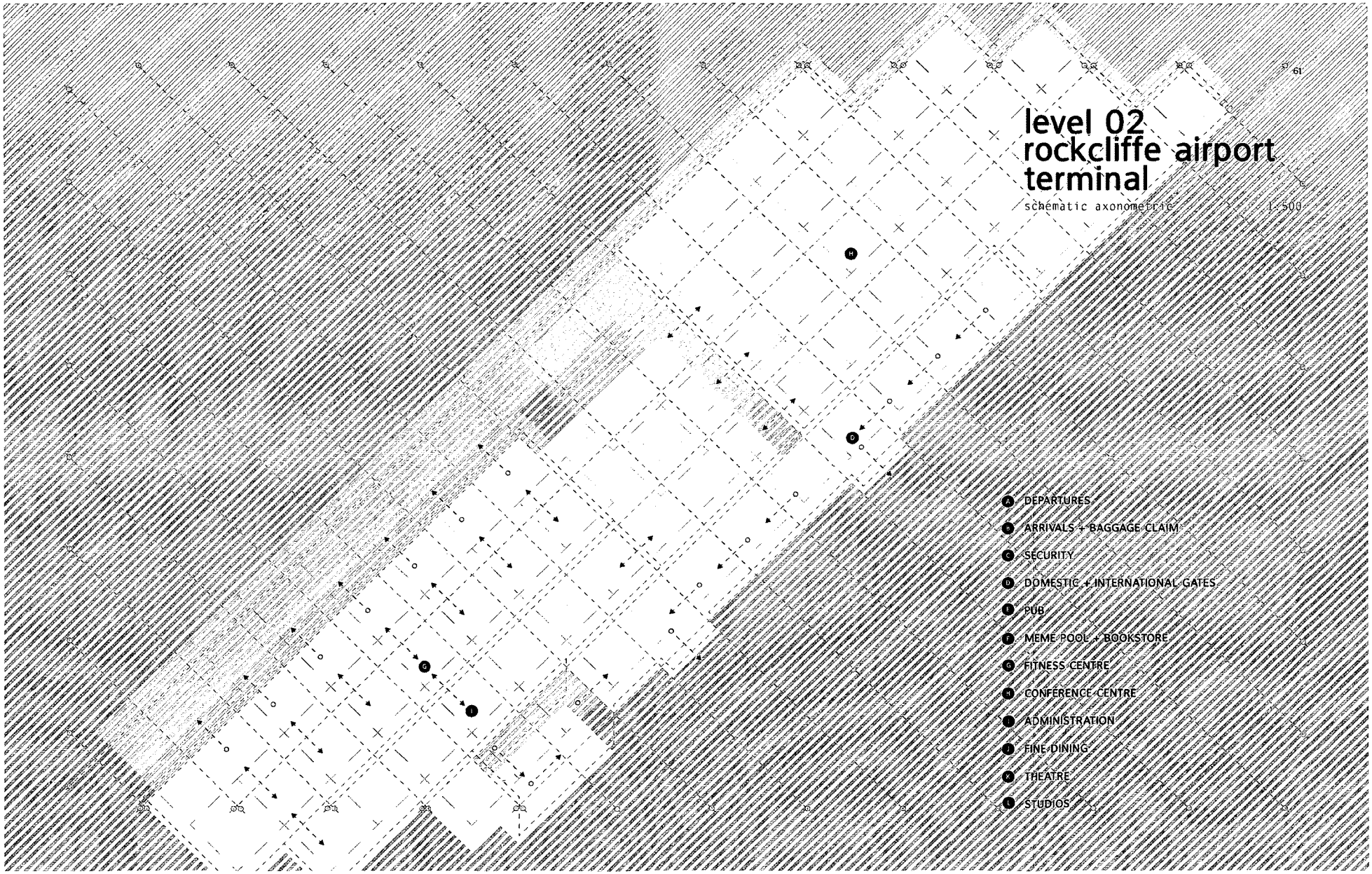
7.2 PROJECT BRIEF

PROGRAM	DETAILS	AREA M2
DEPARTURES	Including quick vehicle drop-off, check-in counters, kiosks, baggage check-in and lounging areas.	1,600
ARRIVALS	Including quick pick-up and lounging area.	800
+ BAGGAGE CLAIM	Including bag carousels.	900
SECURITY	Including 3 domestic + 1 international checkpoints, offices, and administration. Transition to Airside.	1,000
DOMESTIC	Including 4 gates equiped to handle Bombardier DASH8-q400 aircraft and passengers. Airside.	1,200
+ INTERNATIONAL GATES	Including 2 gates equiped to handle Bombardier DASH8-q400 aircraft and passengers. Airside.	800
PUB	Including kitchen, bar, restaurant, patio.	2,000
MEME POOL	Including information centre and access to all non-airside building programs.	1,800
+ BOOKSTORE	Including newsstand, books, and theatre media.	200
FITNESS CENTRE	Including cardio, weight room, classrooms and change and sauna facilities.	1,600
CONFERENCE CENTRE	Including 2 ballrooms, 5 conference rooms and kitchen.	2,900
ADMINISTRATION	Including offices for administration, airline functions and maintenance.	700
FINE DINING	Including kitchen, bar, restaurant.	1,100
THEATRE	Including performance stage with 1,000 seat theatre and back of house functions.	3,300
STUDIOS	Including 2 large practice studios and smaller classrooms.	3,700
	TOTAL	**23,600**


60
level 01
rockcliffe airport
terminal
schematic axonometric
1:500
A DEPARTURES
B ARRIVALS + BAGGAGE CLAIM
C SECURITY
D DOMESTIC + INTERNATIONAL GATES
E PUB
F MEME POOL + BOOKSTORE
G FITNESS CENTRE
H CONFERENCE CENTRE
I ADMINISTRATION
J FINE DINING
K THEATRE
L STUDIOS

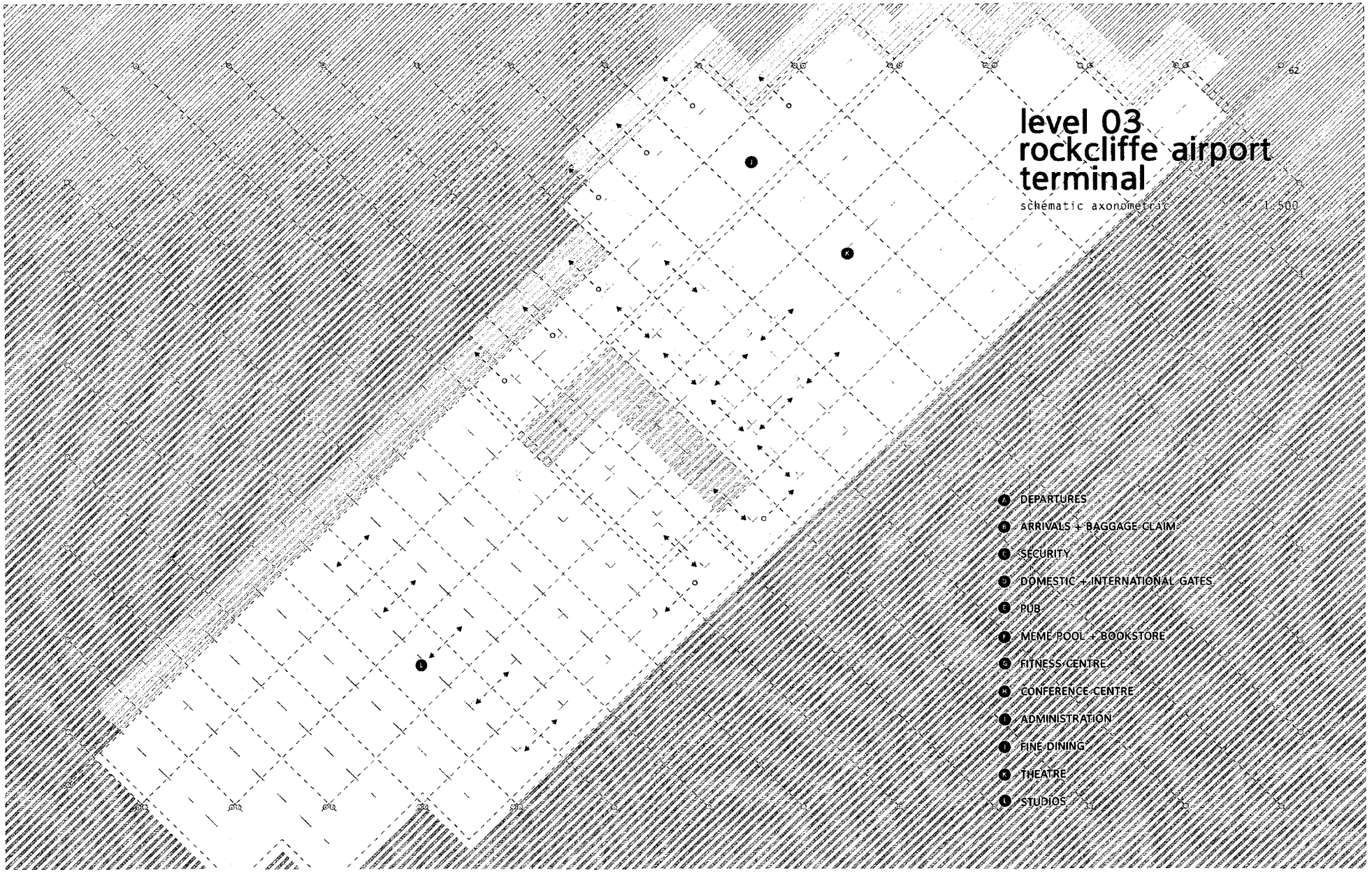
level 02 rockcliffe airport terminal

schematic axonometric 1:500



level 03
rockcliffe airport terminal

schematic axonometric 1:500



- A DEPARTURES
- B ARRIVALS + BAGGAGE CLAIM
- C SECURITY
- D DOMESTIC + INTERNATIONAL GATES
- E PUB
- F MEME POOL + BOOKSTORE
- G FITNESS CENTRE
- H CONFERENCE CENTRE
- I ADMINISTRATION
- J FINE DINING
- K THEATRE
- L STUDIOS

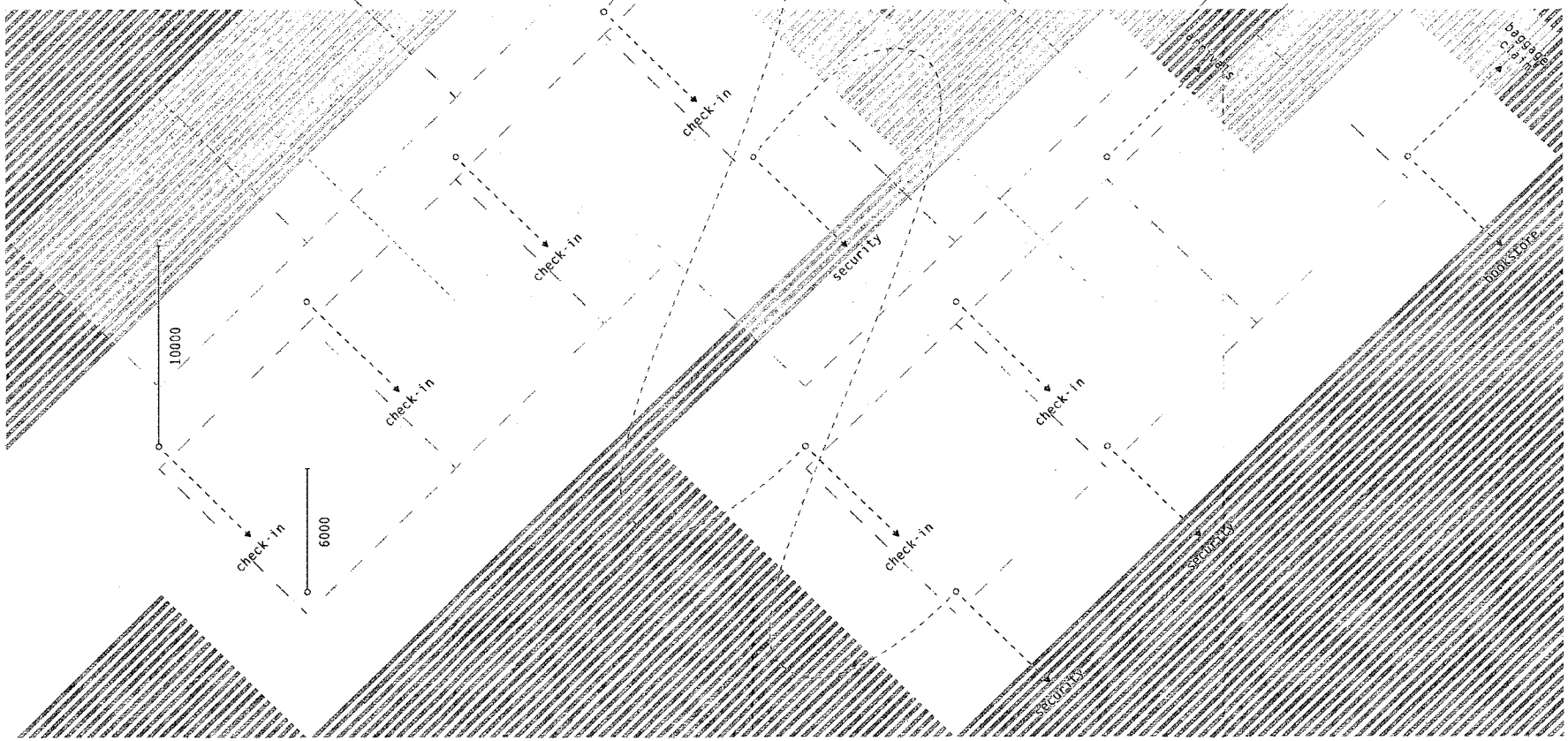
7.3 APPLYING THE OPERATORS

OPERATOR	TEST
REPLICATION	A STRUCTURAL GRID
	DOORS + THRESHOLDS
	SIGNAGE
	STAIRS
ADAPTATION	A SKIN
	AN AIR SYSTEM
	CROSS-PROGRAMMING
	A NETWORKED SYSTEM
KINSHIP	A WAITING AREA
	A MATERIAL CHOICE
	A COMMON SPACE
	GLASS
CONSCIOUSNESS	A VIEWING PLATFORM
	A TRUTHFUL MATERIAL
	A SENSORY SPACE
	A SIMPLE DETAIL
IMPLANTATION	A FACADE
	AN ESTABLISHED NETWORK
	AN AUTONOMOUS PROGRAM
	AN EMBODIED EXPERIENCE

To follow are schematic axonometric drawings of each program identified in the Project Brief. Treated as system diagrams, they illustrate the cellular makeup of each system as well as the relationships between systems. Some work dependently together while others are autonomous, self-supporting systems.

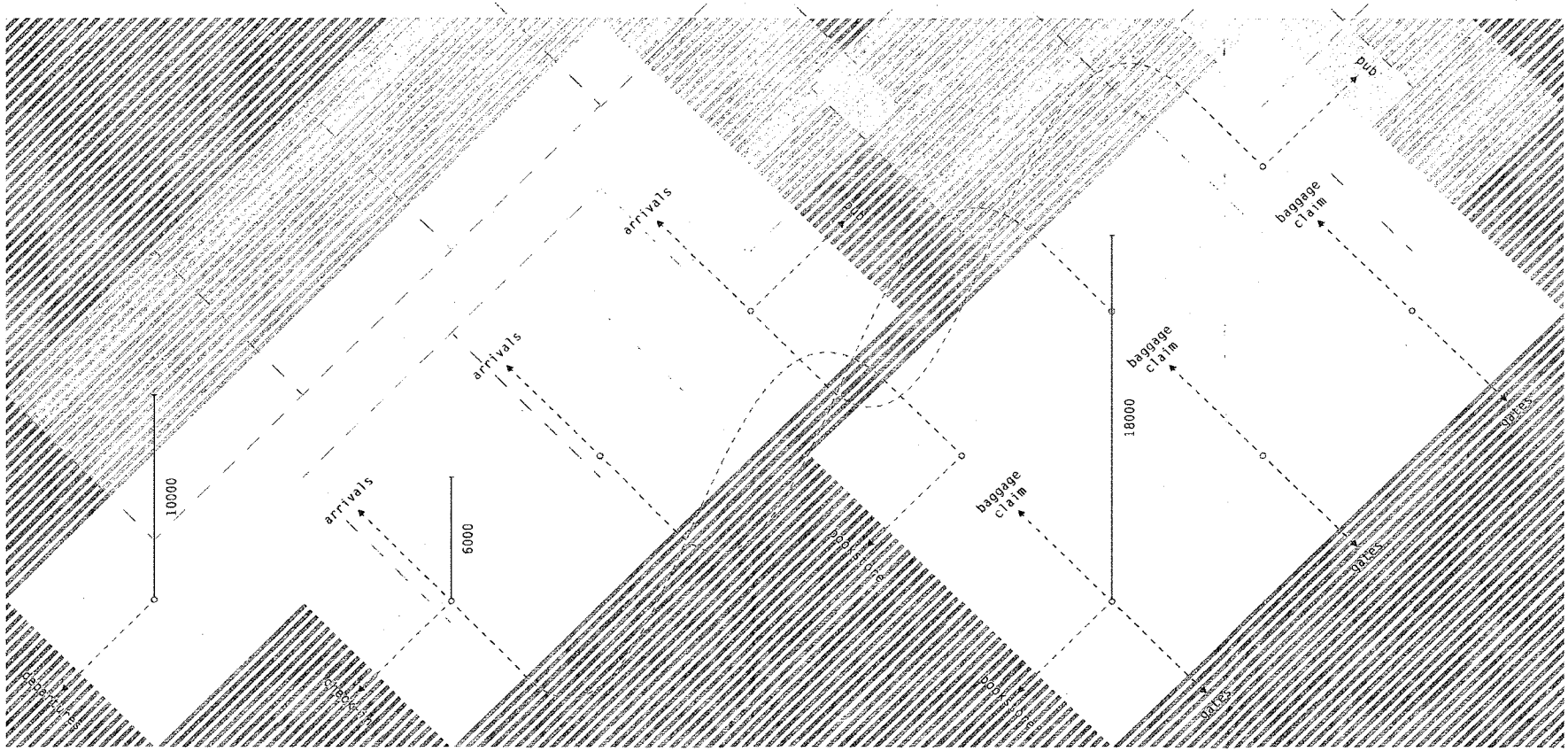
departures

schematic axonometric 1:200



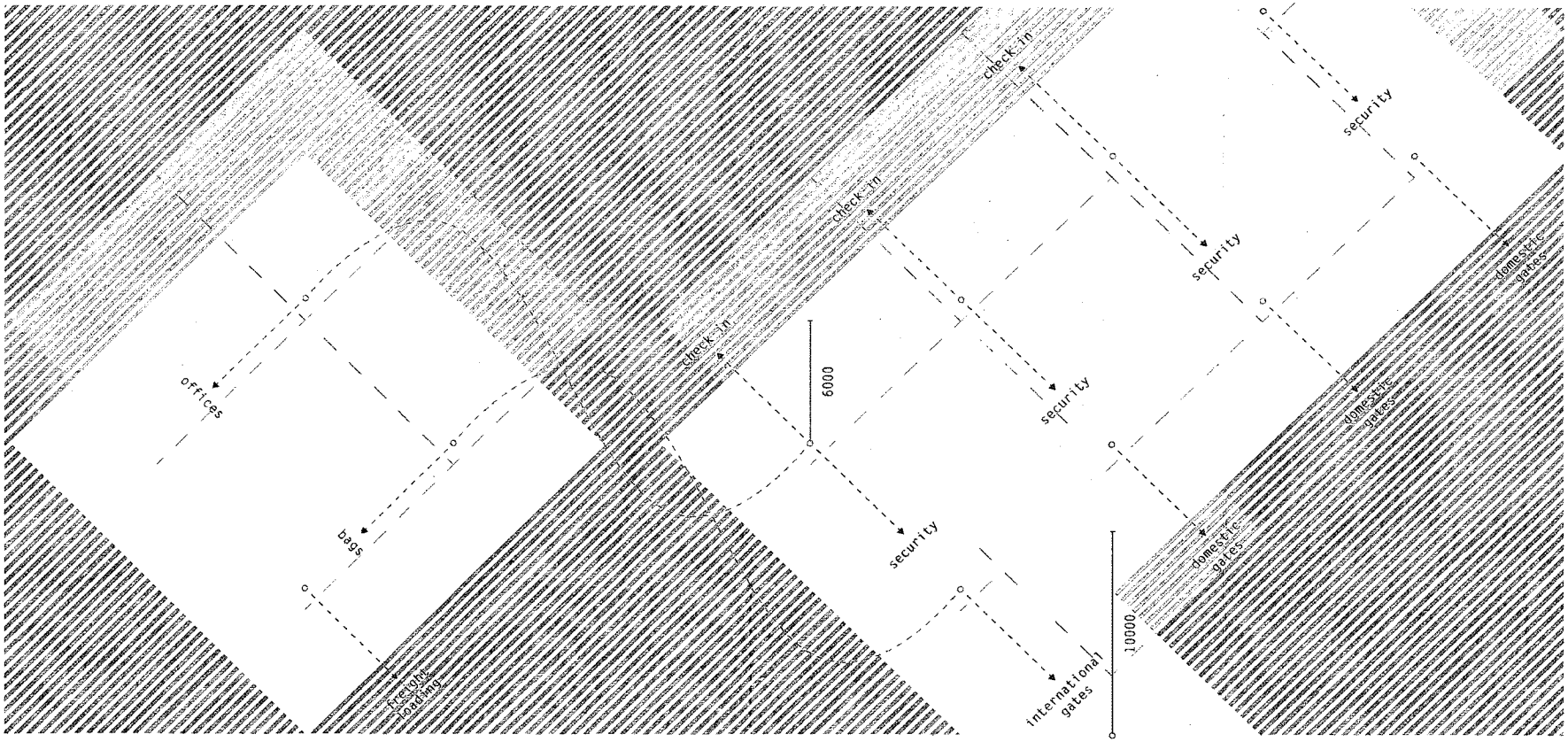
arrivals + baggage claim

schematic axonometric 1:200



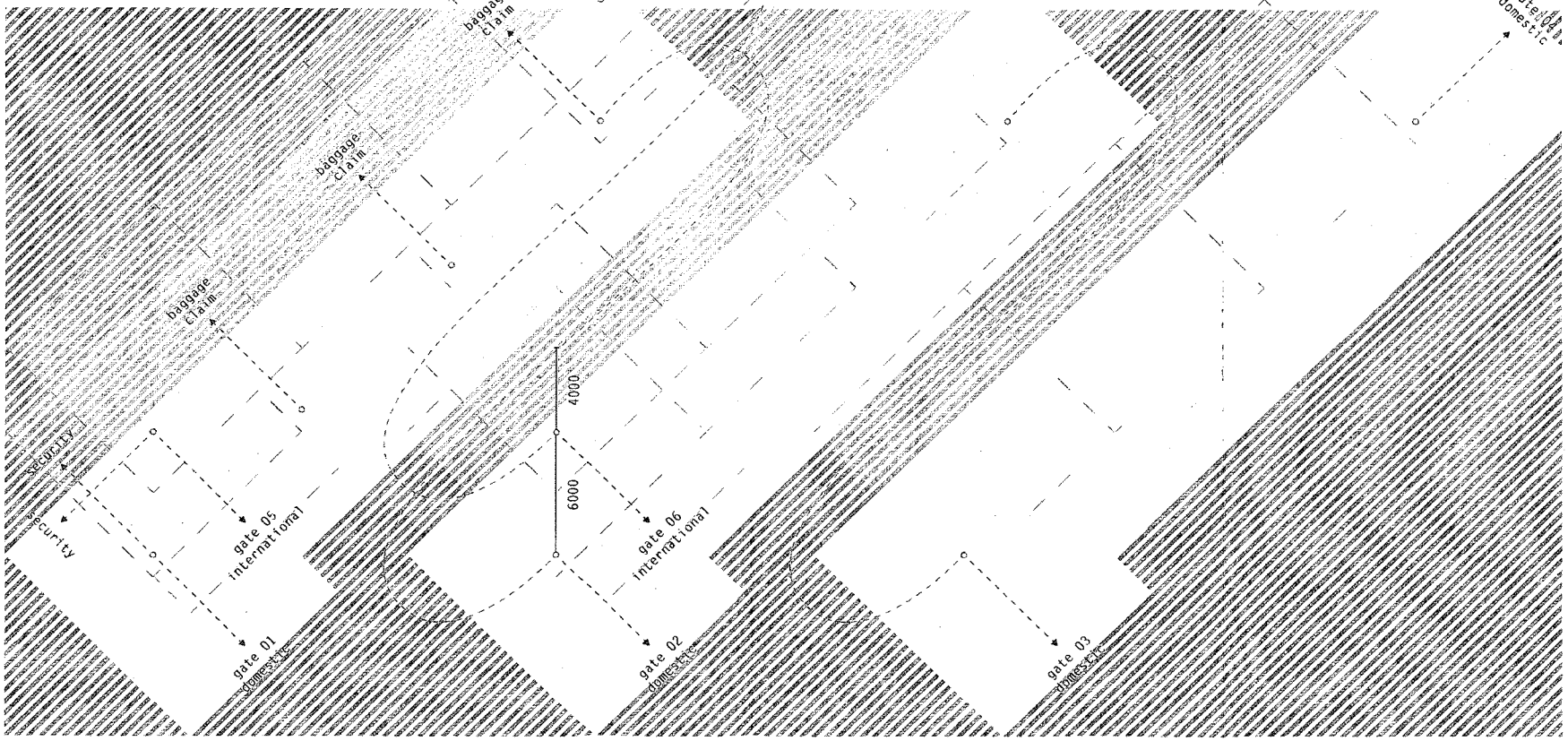
security

schematic axonometric 1:200



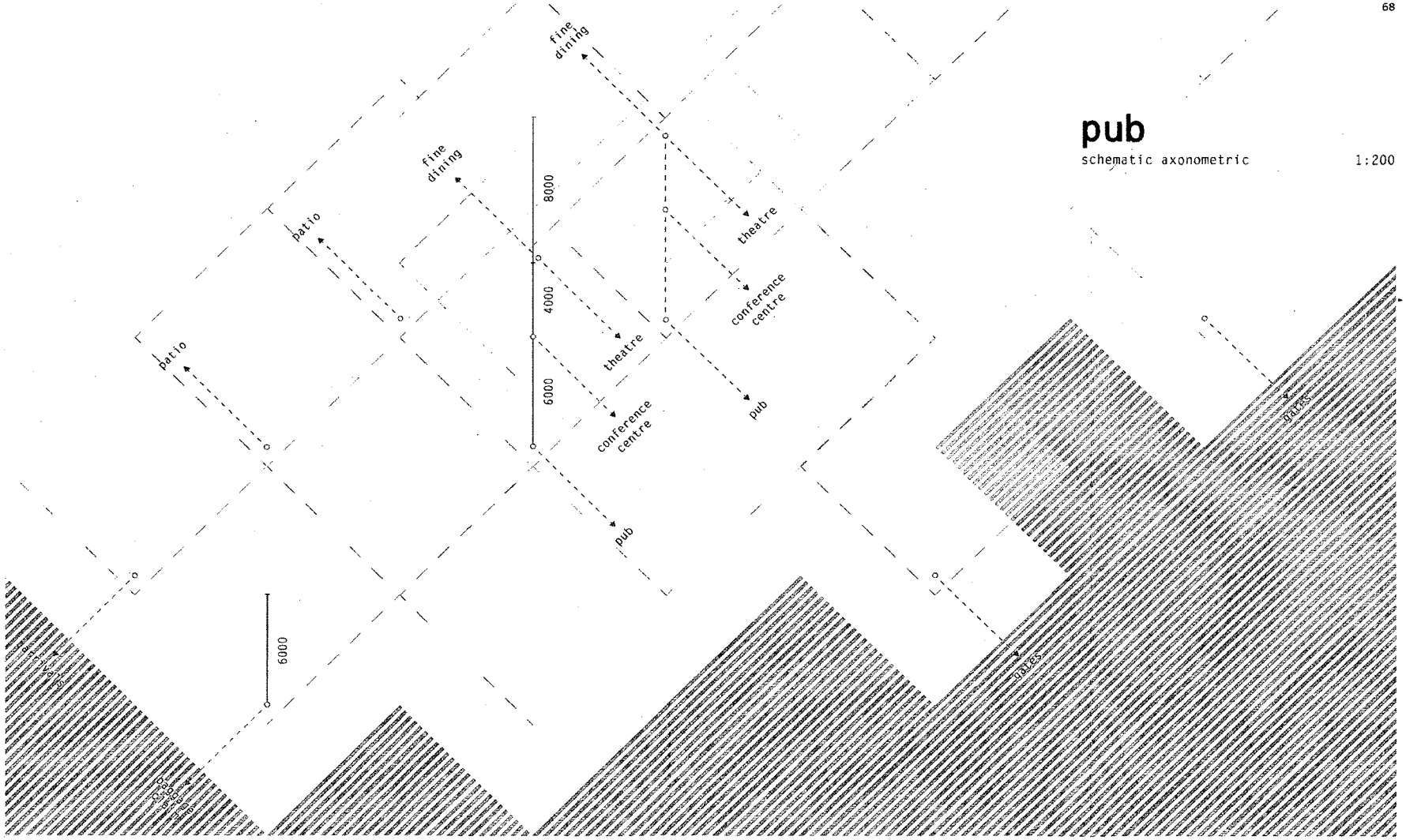
domestic + international gates

schematic axonometric 1:200



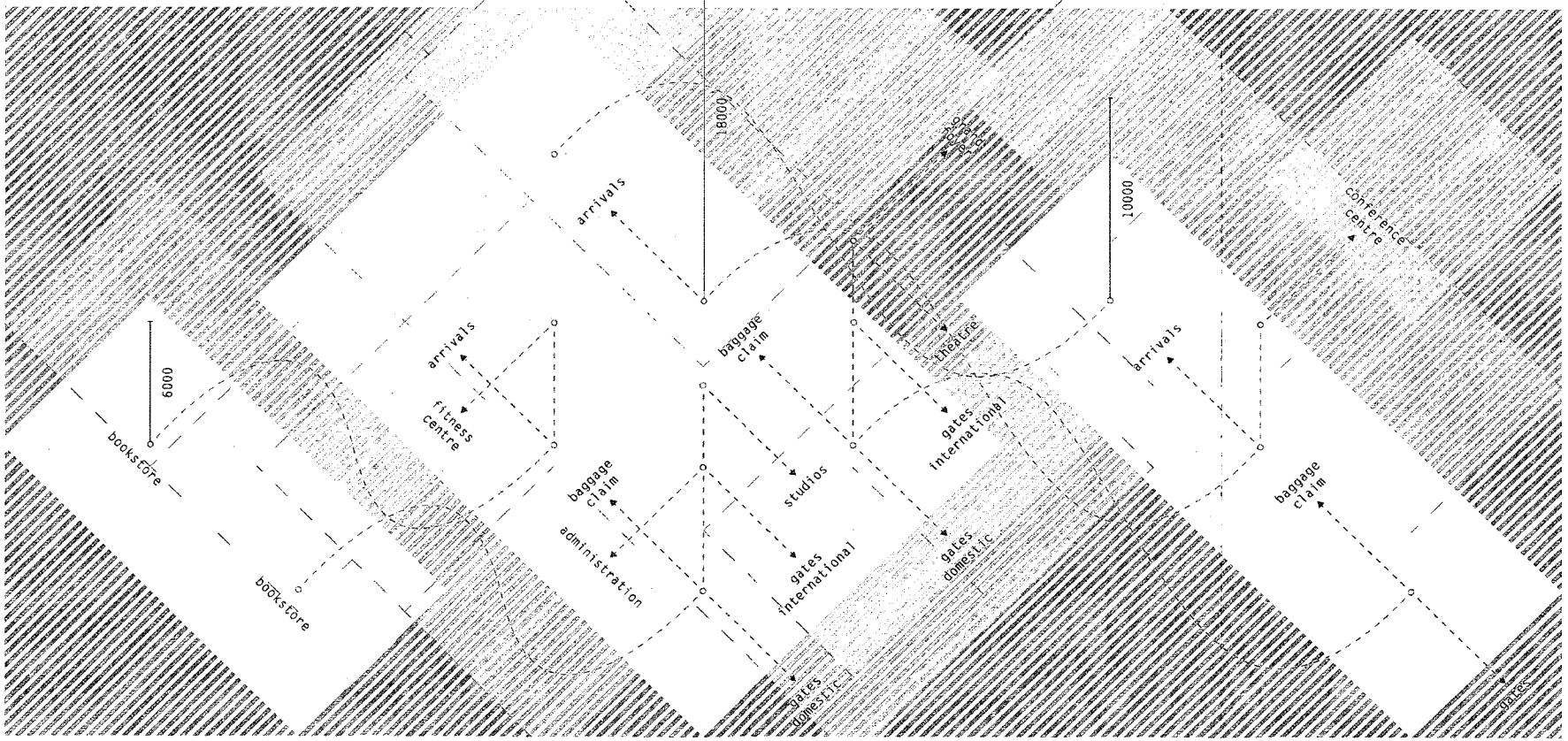
pub

schematic axonometric 1:200



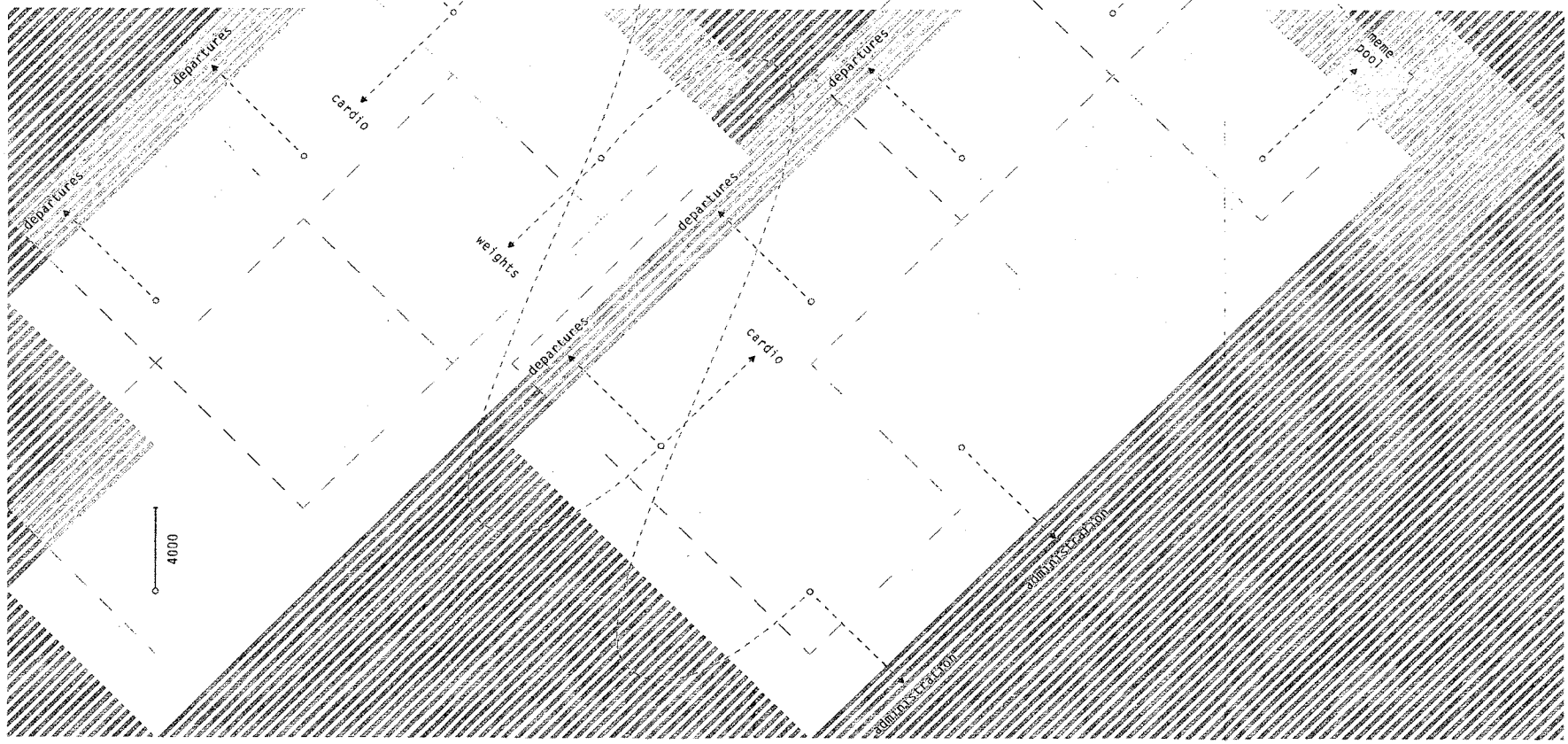
meme pool + bookstore

schematic axonometric 1:200



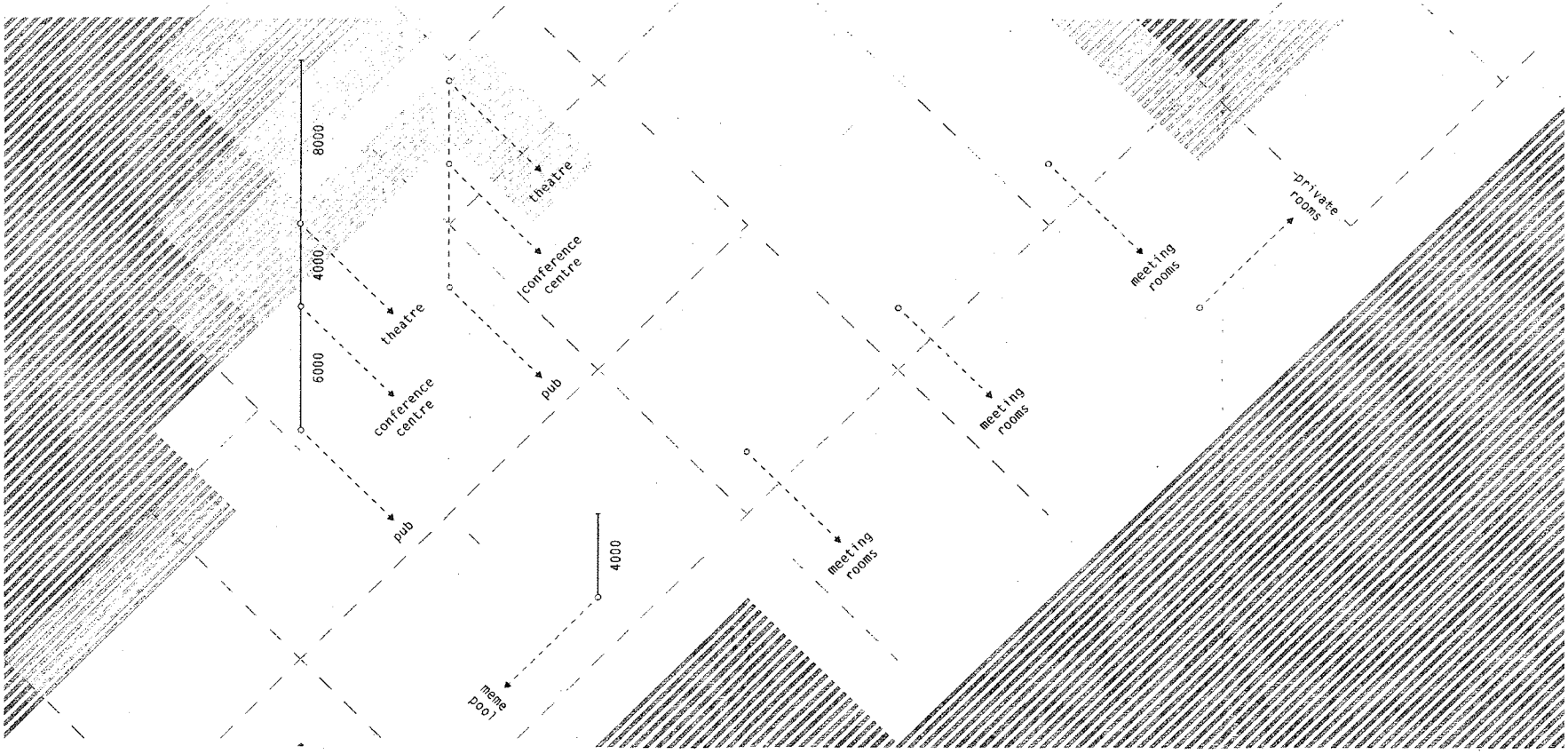
fitness centre

schematic axonometric 1:200



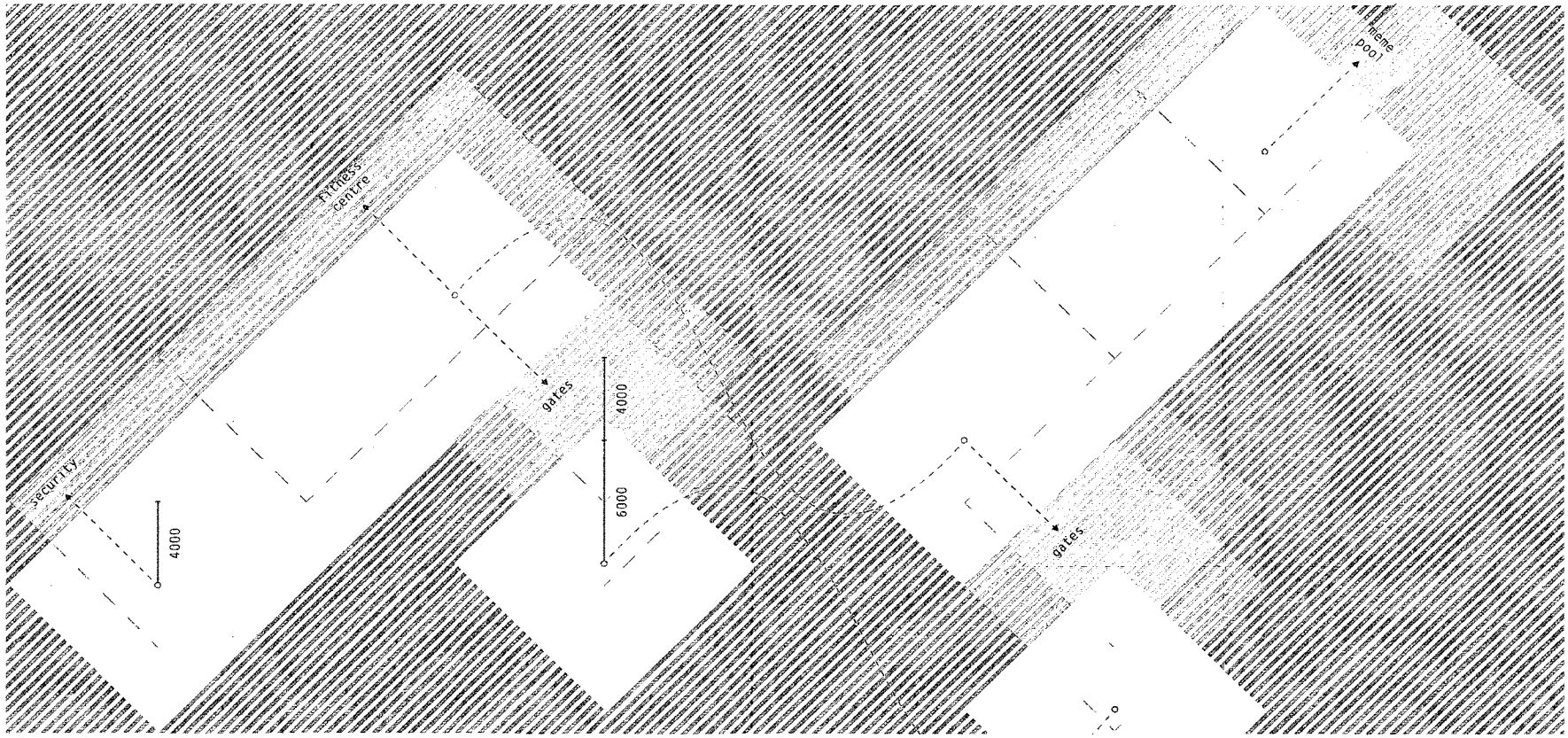
conference centre

schematic axonometric 1:200



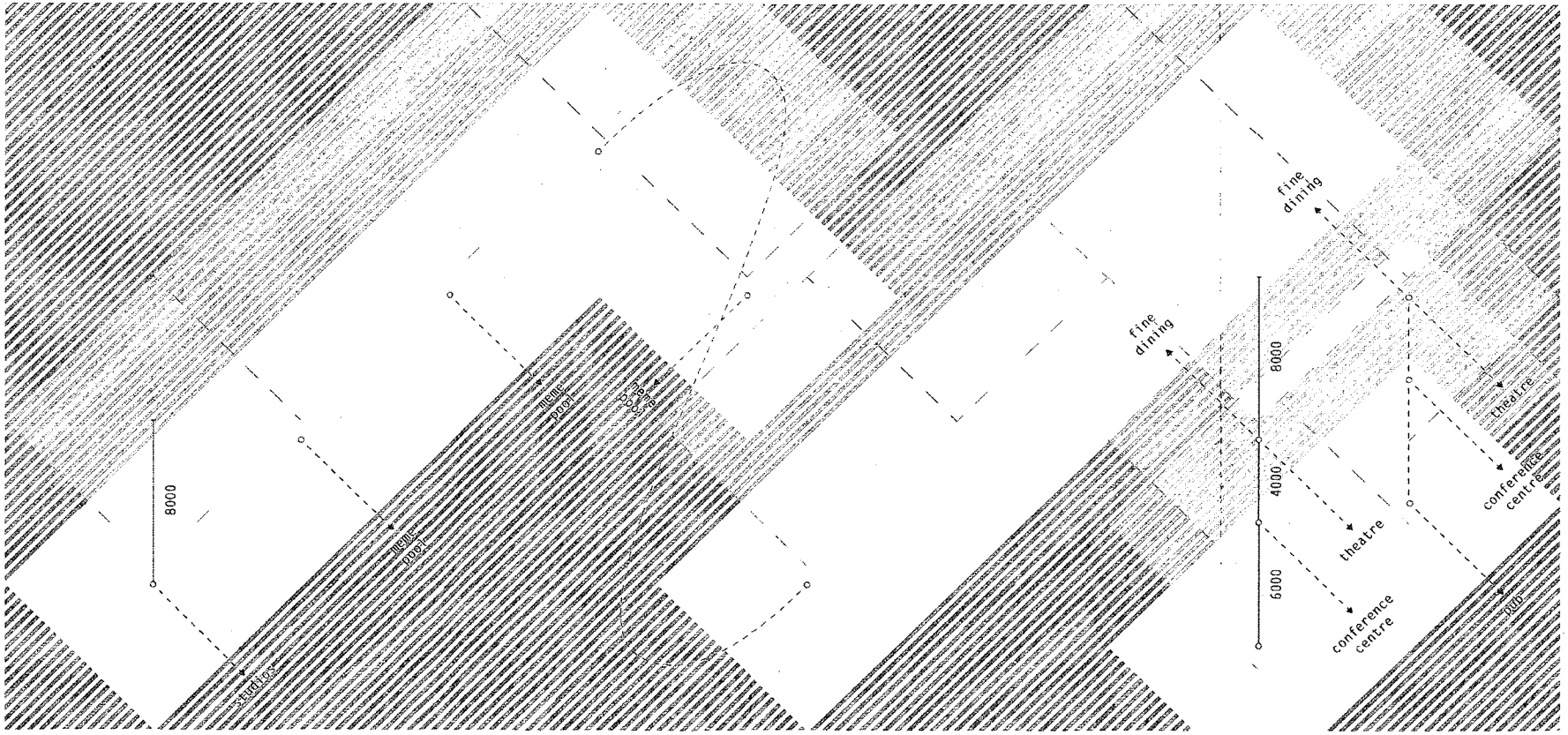
administration

schematic axonometric 1:200



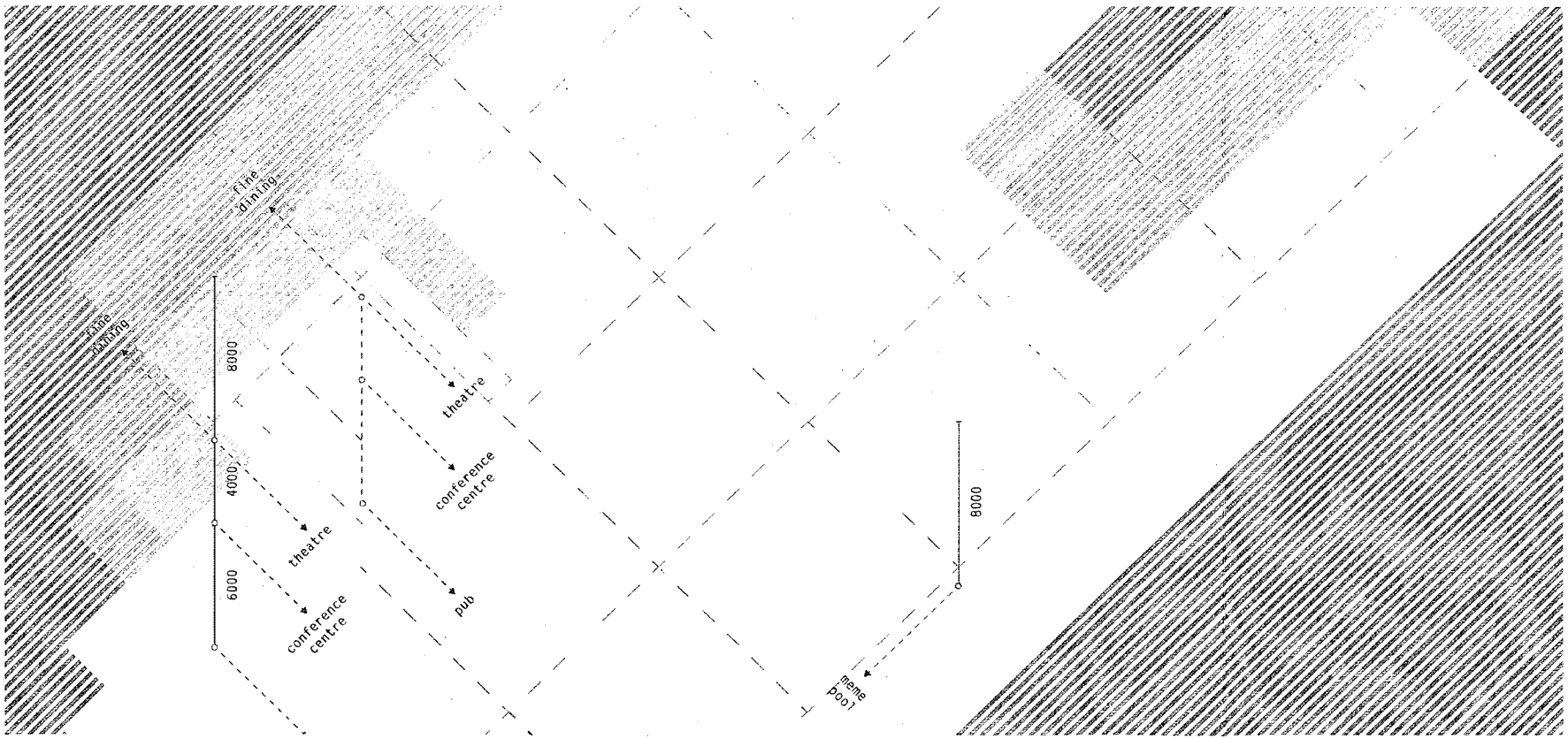
fine dining

schematic axonometric 1:200



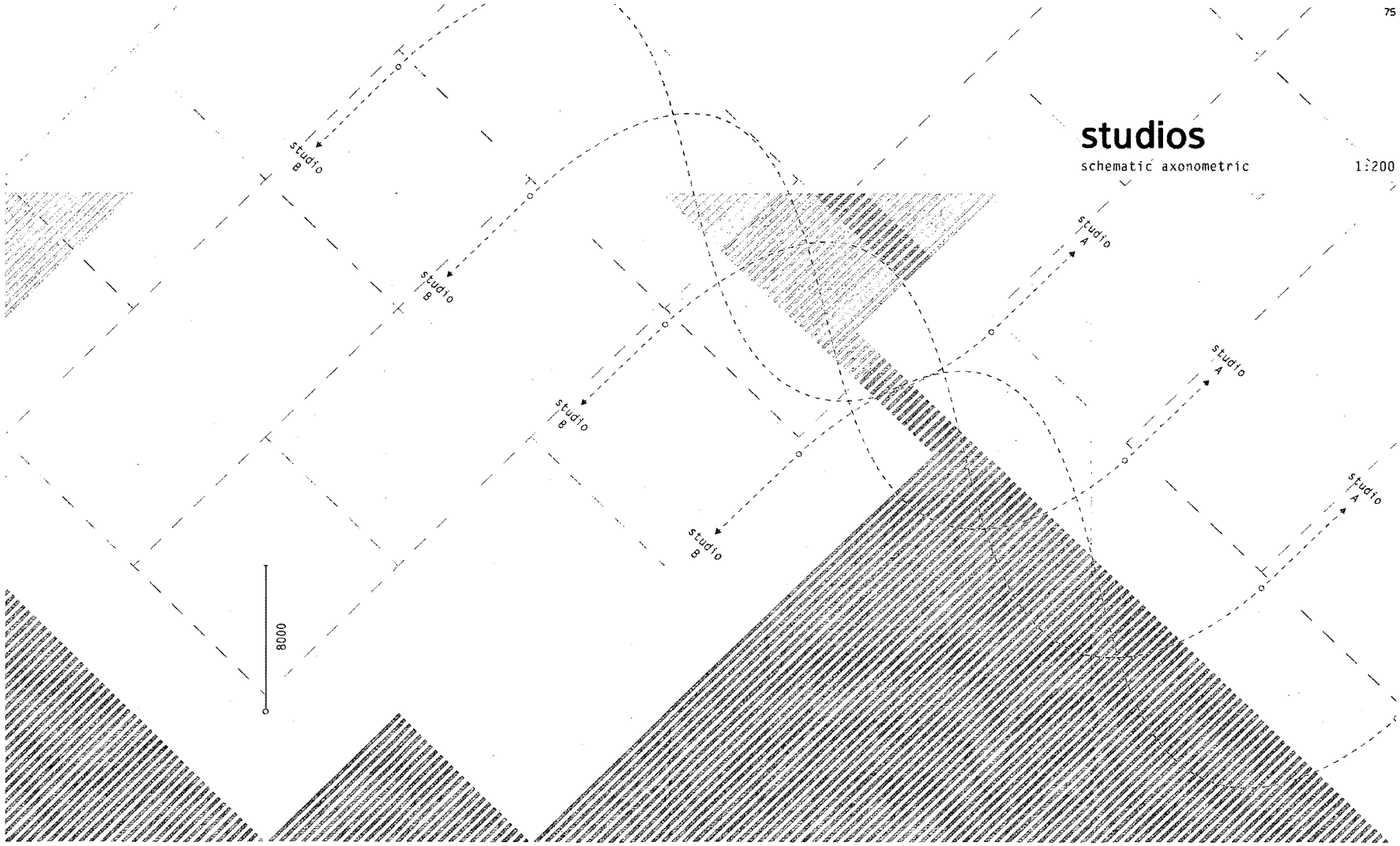
theatre

schematic axonometric 1:200



studios

schematic axonometric 1:200



These systems drawings have inspired five operators used to define selfish architecture, including:

REPLICATION: a capacity for high-fidelity copies that promotes familiarity, consistency and reliability of successful architectural operations

ADAPTATION: the ability for these operations to monitor internal and external conditions and change as necessary to help ensure continued viability

KINSHIP: embedded shared relationships between architectural operations. This is derived via the phenotype or waiting room condition - where linked spaces help eachother.

CONSCIOUSNESS: stems from the awareness of architectural operations. Whether real or illusory, they promote considerate and suitable responses to direct and indirect emergent issues.

IMPLANTATION: The virulent capacity of architectural operations. Elements feeding off of eachother, looking for the opportunity to be seen as a good idea and go viral.

These operators were then expanded: creating 20 tests of architectural details to be imposed on the system framework established for the new Rockcliffe Airport Terminal building. What follows is an analysis of a handful of these tests, which are shown in the

following drawings.

STAIRS: part of replication operator, an element that is copied with high fidelity. They respond to the pre-coded stride of users exhibiting different size, speed or direction.

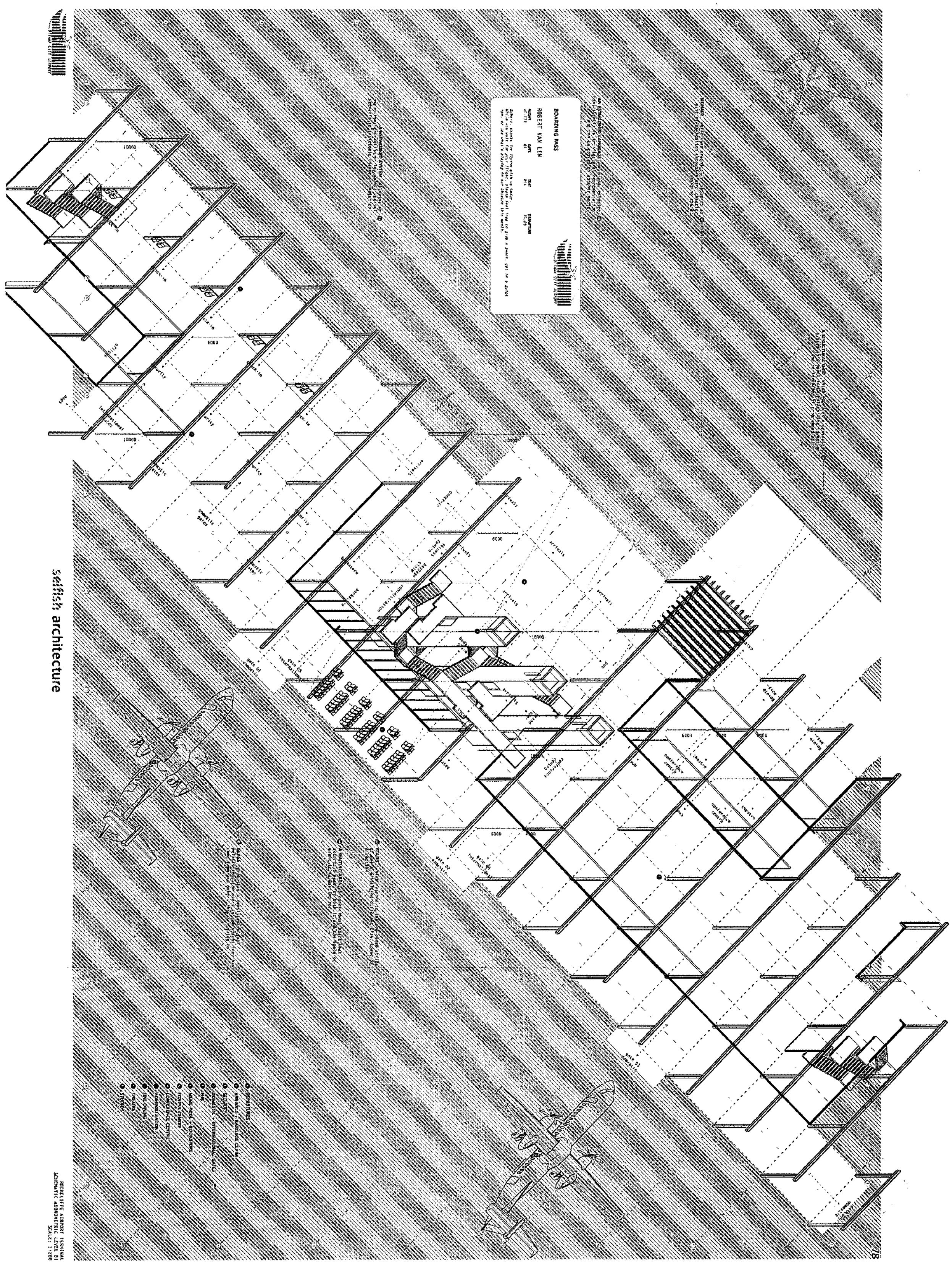
A FAÇADE LINKED WITH AN AIR SYSTEM: a façade of operable louvered trespa panels that guard a plenum wall, where buffered air helps control the building's climate. The **FAÇADE** attaches to the host or structure and imparts representational content like sun and shade. The façade can even enforce an architectural language that can be used in other representational media to pass memetic information about the building, like here where the panels of the façade seen by drivers along Rockcliffe Parkway is used as the logo for the new building seen on a mock boarding pass.

Operators of selfish architecture can even be embedded into architectural detailing, as shown in a parapet detail. Under the consciousness operator, established is **A SIMPLE DETAIL**, which humbly and elegantly performs its purpose, knowing exactly what it is and assumes nothing more. One could discuss the inclusion of a simple saw cut to the underside of a concrete lintel as such: something that performs its task simply, elegantly, and therefore becomes a permanent and reliable element of the building's architecture.

rockcliffe airport terminal

level 01

Note: Drawing is scaled to 38% of original size.

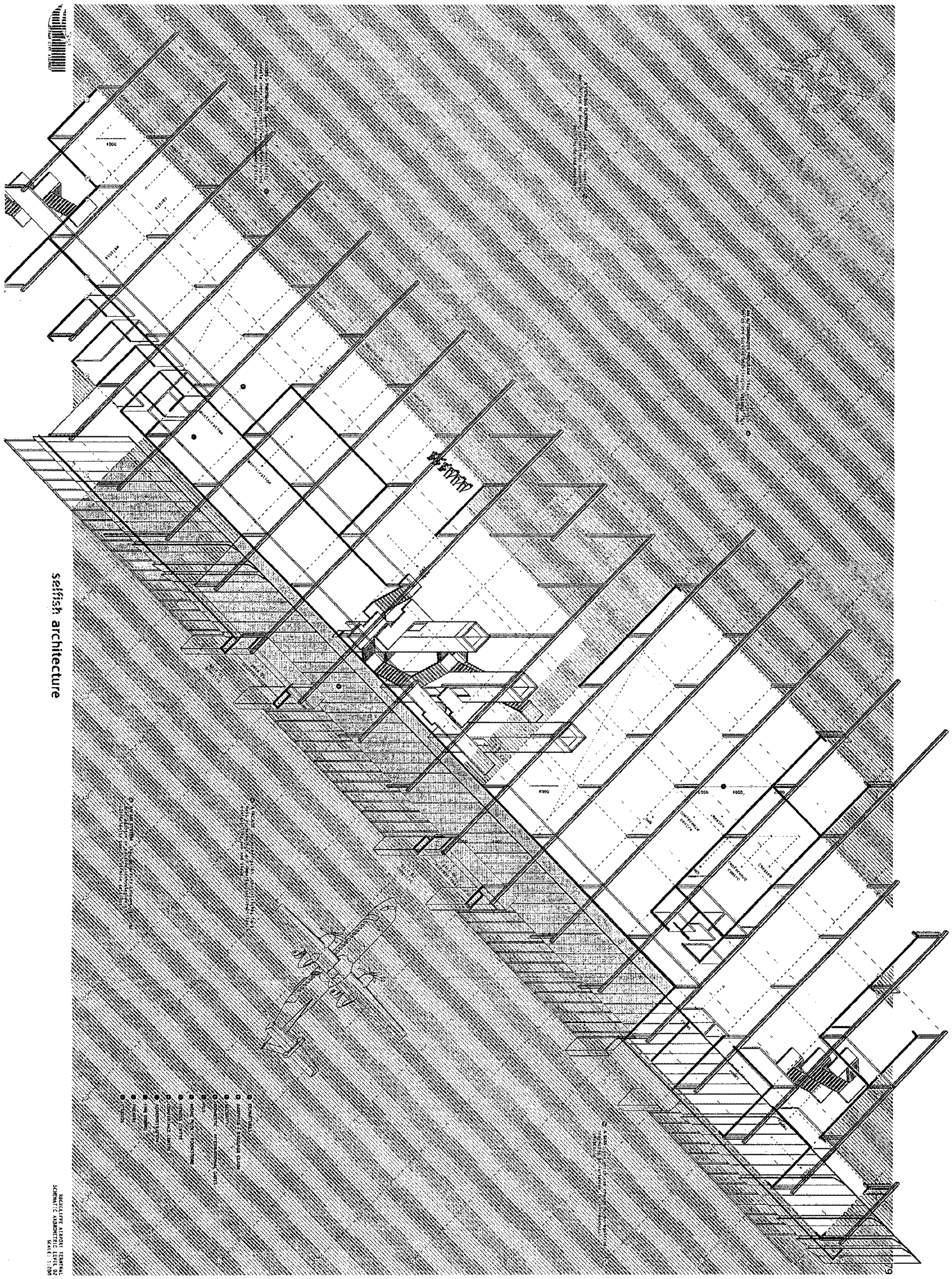


selfish architecture

rockcliffe airport terminal

level 02

Note: Drawing is scaled to 38% of original size.

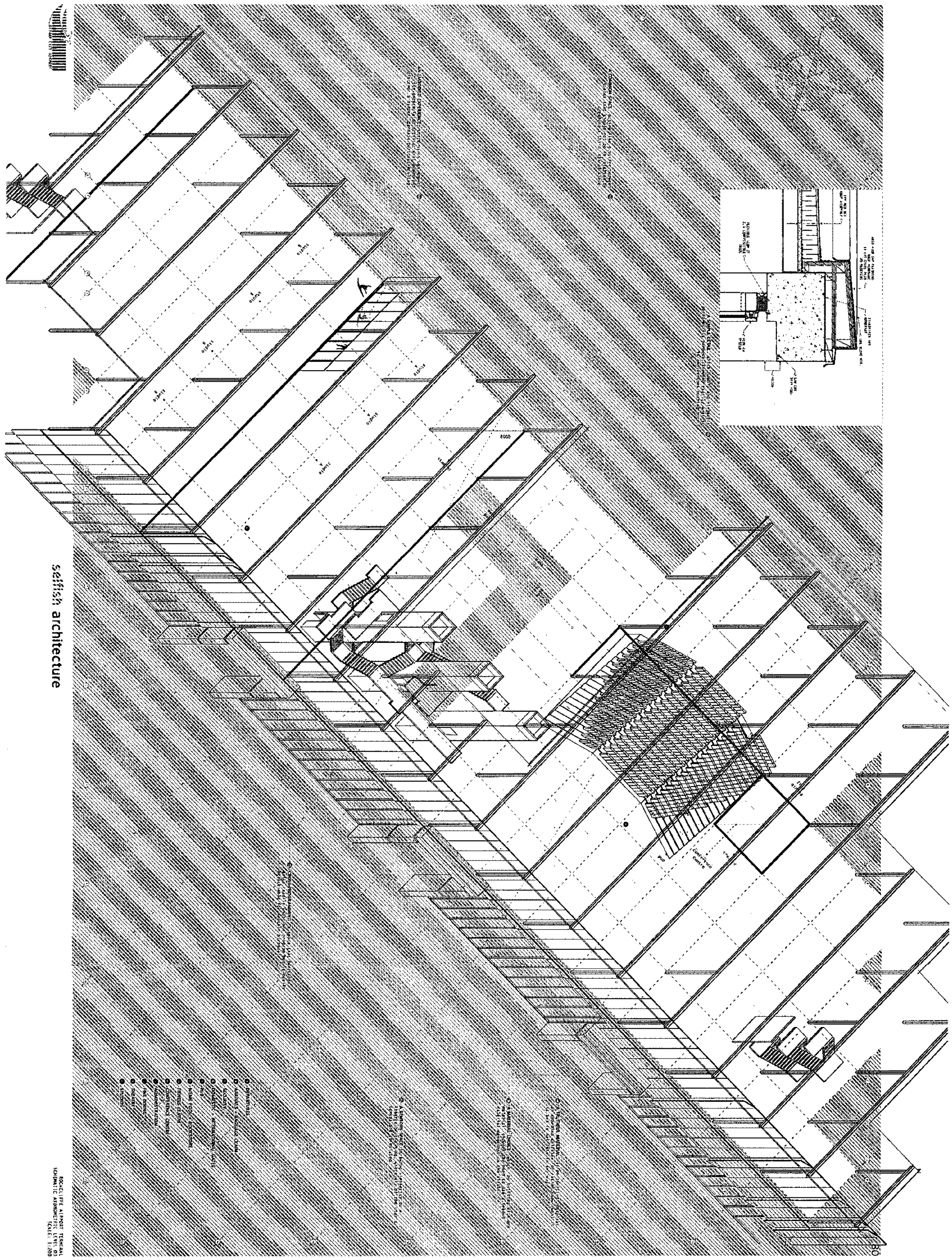


selfish architecture

rockcliffe airport terminal

level 03

Note: Drawing is scaled to 38% of original size.



selfish architecture

structural system model

rockcliffe airport terminal 1:200

024 Meme Pool, Domestic + International Gates

025 Departures, Fitness Centre + Studios

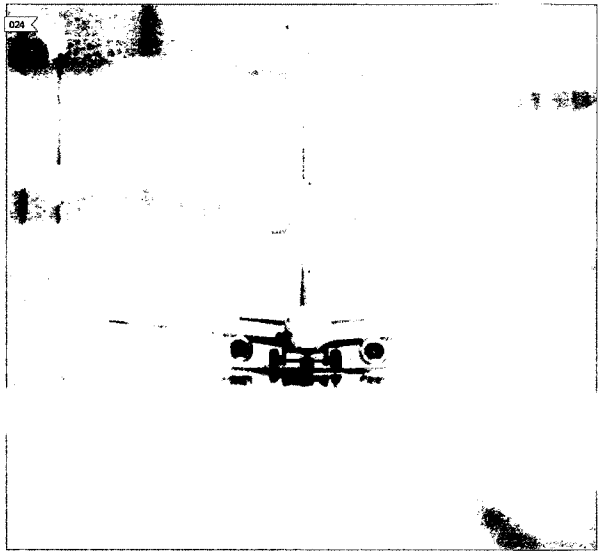
026 Arrivals + Baggage Claim.

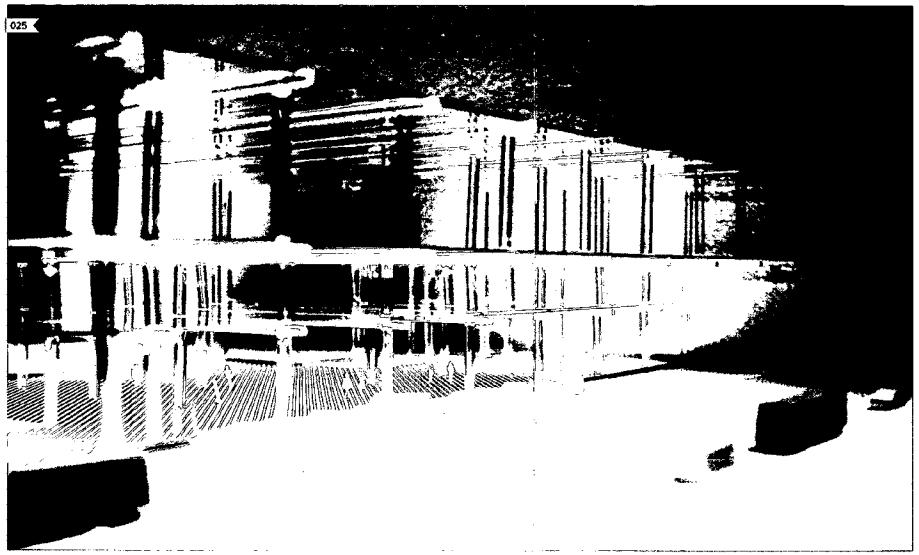
027 Pub, Conference Centre, Theatre + Meme Pool

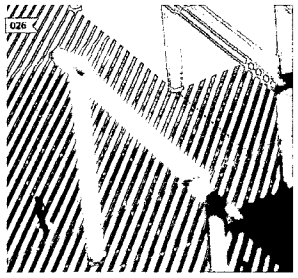
028 Domestic + International Gates

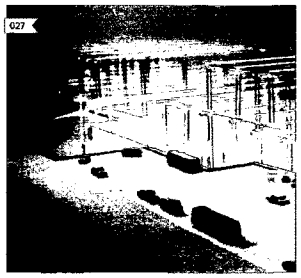
029 Structural System Model

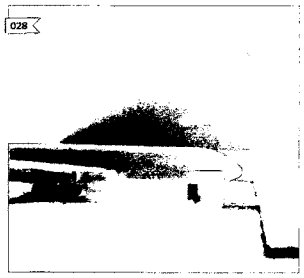
030 Arrivals + Meme Pool

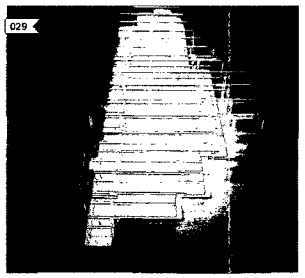


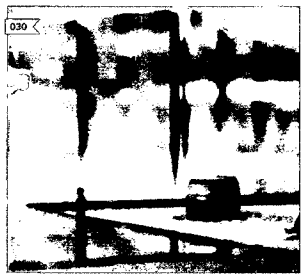












"*The aeroplane is the product of close selection.*

The lesson of the aeroplane lies in the logic which governed the statement of the problem and its realization.

The problem of the house has not yet been stated.

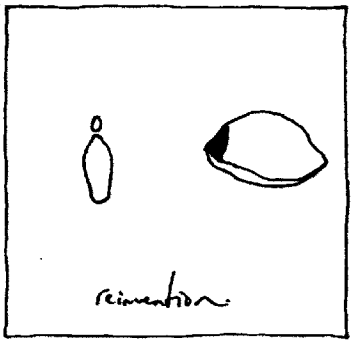
Nevertheless there do exist standards for the dwelling house.

Machinery contains in itself the factor of economy, which makes for selection.

The house is a machine for living in."*

LE CORBUSIER
Architect.

* Le Corbusier, Trans by Frederick Etchells. Towards A New Architecture. New York: Dover Publications Inc, 1986. p. 60.



coding selfish architecture: a manifesto

POST-SCRIPT

The airport model as we know it is dead. To return back to the point of departure for this thesis, British Airways and Iberia CEO Willie Walsh says it best: "[...] many airlines must face the truth that they should consolidate or die."[1]

The proposal for Rockcliffe Airport encapsulated within this research has enabled a viable, reinvented model for the site. Once secured by a lonely museum in steady decline, the implantation of a commuter flight venture cross-programmed with community-oriented spaces has dramatically increased its capacities for fitness.

Although the five operators have successfully created a system model for a new terminal at Rockcliffe Airport, one key question remains: could selfish architecture be proposed as an operative design strategy to save other flight-risk buildings? This

marks a key shift in architectural thinking that, I believe, must happen to enable architecture with the tools to remain viable: a return-shift from architecture as an object to architecture as a system.

Looking back at other systems architectures, or anti-architectures like Cedric Price's The Fun Palace and Archigram's Plug-In City and Walking City, one can quickly see how the cybernetic framework of Beer's Viable System Model empowers the user to adapt their architecture for change. The architect becomes anti-architect, a non-author, simply an enabler of a capable playground within which other viable scenarios begin to follow the processes of selection, variation and replication learned from genetic/ memetic transmmission.

This balance between authorship and selfishness brings with it a demand for agency; for socially activist architecture. Price's goal in the Fun Palace was to enable architecture to adapt to the changing needs of society, and hopefully to enhance the quality of life of the people who experienced it. Might the motivation for such a readerly architecture be seen as Price's pursuit of a new social and political paradigm of democracy and individual agency? With implications of cybernetics and social control it is equally worth asking whether, today, an

attempt to establish users as the authors of their own architecture is a genuine effort to erase social boundaries, or if it is simply a gesture motivated by compassion.

Authorship as agency tries to erase a persistent conscious-illusion, creating a cultural launching pad for architectural transmissions to flourish. Perhaps, as evolutionary biologists and sociobiologists suggest, at a most elemental level, it is the selfish action of our genes for survival that ensures the viability of all architectural methods.

As critical as these processes may be, let us end with the important analogy that frames the total ideology of this research: the necker cube. This thesis tries to distance airport architecture away from the object - the shopping mall model on the verge of collapse, and instead promotes the establishment of a permanence in architecture as a search for a viable system. Admittedly, however, it is suggested only as one of many simultaneously oscillating views around the same issue, that being a search for ways to ensure the survival and evolution of flight-risk buildings.

Notes

1 Walsh, Willie. "Surviving the Crisis." O'Connell, John F and George Williams. Air Transport in the 21st Century: Key Strategic Developments. Surrey: Ashgate, 2011. p. 55.

keywords

ALLELE *A shorthand form of allelomorph, one of a series of possible alternative forms of a given gene (cistron), differing in DNA sequence, and affecting the functioning of a single product (RNA and/or protein).*[1] *Each of two or more alternative forms of a gene that arise by mutation and are found at the same place on a chromosome.*[2]

FITNESS *The relative ability of an organism to survive and transmit its genes to the next generation.*[3]

FOUNT *A shortening of fountain (compare mount and mountain), mainly used in poetry and for special effect. It also occurs with the meaning 'source, origin' in phrases such as the fount of all wisdom, knowledge, etc.*[4]

GENE *A unit of heredity composed of DNA. In classical genetics (see Mendelism) a gene is visualized as a discrete particle, forming part of a chromosome, that determines a particular characteristic. It can exist in different forms called alleles, which determine which aspect of the characteristic is shown (e.g. tallness or shortness for the characteristic of height). A gene occupies a specific position (locus) on a chromosome. In view of the discoveries of molecular genetics, it may be defined as the sequence of nucleotides of DNA (or RNA) concerned with a specific function, such as the synthesis of a single polypeptide chain or of a messenger RNA molecule, corresponding to a particular sequence of the genetic code. One or more of these structural genes, coding for protein, may be associated with other genes controlling their expression.*[5]

HOST *An organism whose body provides nourishment and shelter for a parasite.*[6]

ILLUSION *An instance of a wrong or misinterpreted perception of a sensory experience; a deceptive appearance or impression; a false idea or belief.*[7]

KINSHIP *Kinship is one of the main organizing principles of human society, and kinship systems have been extensively studied by social anthropologists, for whom they are of particular importance because of their primacy in non-state societies. Kinship systems establish relationships between individuals and groups on the model of biological relationships between parents and children, between siblings, and between marital partners.*[8]

MEME *A self-replicating unit of cultural inheritance analogous to a gene. The term was introduced by British biologist Richard Dawkins in his book The Selfish Gene (1976) to denote a cultural entity, such as a song, a method for making paper aeroplanes, a religion, or a recipe, that is transmitted between individuals and across generations, so that it is inherited and (potentially) can change over time. Such a concept can provide useful insights into the nature of cultural development. More controversial is the supposed role of memes in shaping the evolution of the human brain by a form of sexual selection. Proponents argue that memes, such as musical compositions or literary works, are manifestations of genetically determined attributes of the meme donor's brain and make the donor more attractive to potential mates. Hence such admired or talented individuals tend to have more offspring, who inherit their parent's meme-generating abilities. Selection for such traits over time would, it is claimed, enhance the size and complexity of the brain.*[9]

OPERATOR *A chromosomal region capable of interacting with specific repressors, thereby controlling the function of adjacent cistrons.*[10]

PHENOTYPE *The observable characteristics of a cell or an organism, such as its size and shape, its metabolic functions, and its behavior. The genotype is the underlying basis of the phenotype, and the term is commonly used to describe the effect a particular gene produces, in comparison with its mutant alleles. Some genes control the behavior of the organism, which in turn generates an artefact outside the body. R. Dawkins uses the term extended phenotype to refer to the production of such an artefact (spider webs, bird nests, and beaver dams are examples).*[11]

REPLICATOR *A thing which replicates or copies something; a structural gene at which replication of a specific replicon is believed to be initiated.*[12]

SELFISH *A key feature of Mendelian inheritance is that it is usually fair: organisms pass on the two copies of each gene with equal frequency to the next generation. This means that the process of inheritance per se has no directional effect on allele frequencies, and it is only natural selection—the differential survival and reproduction of individuals with different genotypes—that can have such an effect. Thus, most genes persist in populations because they increase the fitness of the organisms in which they reside. However, not all inheritance is fair, and in particular some genes contrive to be inherited at a greater-than-Mendelian rate. This allows the genes to increase in frequency and persist in populations even if they are harmful to the host organism. These are known as selfish genes, or selfish genetic elements.*[13]

VIABLE *Originally meant "capable of living; fit to live," a sense that still applies in many phrases, such as a viable fetus. By acceptable extension it has come to refer figuratively to any idea or thing that might flourish. But in this use it's a vogue word that can often be improved on—e.g.: "They now have a viable [read plausible] successor to the Speaker in New York Congressman Bill Paxon" (New Republic). The word has lately been the victim of slipshod extension, when used in the sense "feasible, practicable" <a viable plan>. One writer has noted that "dictionaries now give [as definitions for viable] real, workable, vivid, practicable, important, newer definitions that seem only to confirm the critics' complaints that the word has had the edge hopelessly ground off it" (Roy Copperud, American Usage and Style, 1980). Thus it is sometimes hard even to know what a writer means with viable—e.g.: "The white cotton shirt is still viable [read acceptable or, possibly, a possibility], but it could also be traded for a softer, sheer-mesh top" (Dallas Morning News).*[14]

VIRAL *Of the nature of, caused by, or relating to a virus or viruses; relating to or involving the rapid spread of information about a product or service by viral marketing techniques: a viral video ad; an image, video, advertisement, etc. that is circulated rapidly on the Internet.*[15]

Notes

1 A Dictionary of Genetics. Robert C. King, William D. Stansfield and Pamela K. Mulligan. Oxford University Press, 2007. Oxford Reference Online. Carleton University. 02 Mar 2012. <http://www.oxfordreference.com/views/ENTRY.html?subview=Main&entry=t224.e0201>

2 Oxford Dictionary of English. Edited by Angus Stevenson. Oxford University Press, 2010. Oxford Reference Online. Carleton University. 02 Mar 2012 <http://www.oxfordreference.com/views/ENTRY.html? subview=Main&entry=t140.e0019740>

3 A Dictionary of Genetics. 02 Mar 2012. <http://www.oxfordreference.com/views/ENTRY.html?subview=Main&entry=t224.e2276>

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5 A Dictionary of Biology. Elizabeth Martin and Robert Hine. Oxford University Press, 2008. Oxford Reference Online. Carleton University. 02 Mar 2012. <http://www.oxfordreference.com/views/ENTRY.html? subview=Main&entry=t6.e1816>

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8 A Dictionary of Sociology. John Scott and Gordon Marshall. Oxford University Press 2009. Oxford Reference Online. Carleton University. 02 Mar 2012. <http://www.oxfordreference.com/views/ENTRY.html? subview=Main&entry=t88.e1206>

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11 A Dictionary of Genetics. 02 Mar 2012. <http://www.oxfordreference.com/views/ENTRY.html?subview=Main&entry=t224.e4813>

12 Oxford Dictionary of English. 02 Mar 2012. <http://www.oxfordreference.com/views/ENTRY.html? subview=Main&entry=t140.e0701860>

13 Burt, Austin. Encyclopedia of Evolution. Ed. Mark Pagel. Oxford University Press 2003. Carleton University. 02 Mar 2012. <http://www.oxfordreference.com/views/ENTRY.html?subview=Main&entry=t169.e373>

14 The Oxford Dictionary of American Usage and Style. Bryan A. Garner. Oxford University Press, 2000. Oxford Reference Online. Carleton University. 02 Mar 2012. <http://www.oxfordreference.com/views/ENTRY.html?subview=Main&entry=t26.e2218>

15 Oxford Dictionary of English. 02 Mar 2012. <http://www.oxfordreference.com/views/ENTRY.html? subview=Main&entry=t140.e0929700>

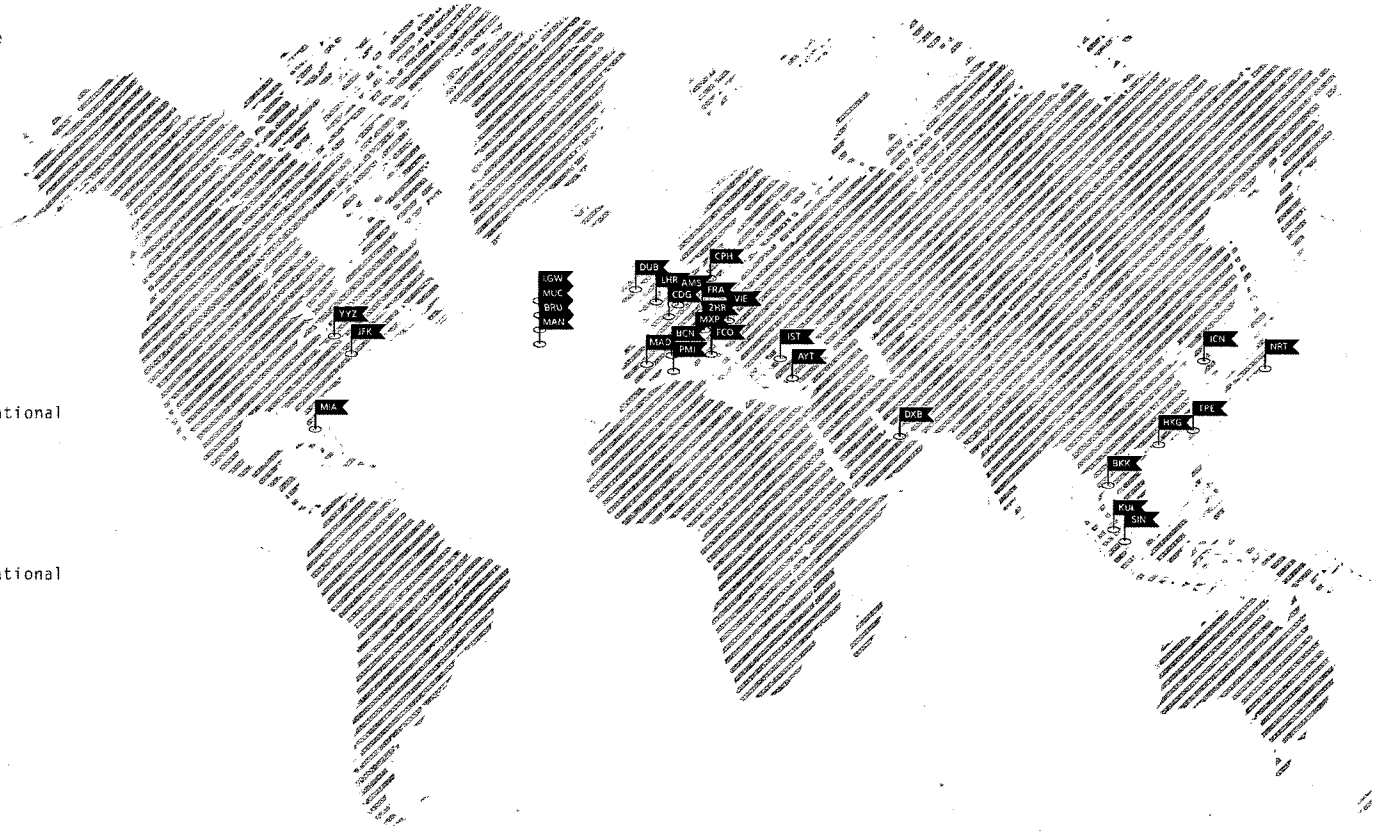
appendices

mapping the world's busiest airports

appendix A

WORLD'S BUSIEST AIRPORTS
BY INTERNATIONAL PASSENGER TRAFFIC (2010)

49,065,604	LHR	London Heathrow
42,412,227	CDG	Paris Charles de Gaulle
39,284,000	HKG	Hong Kong International
37,962,760	AMS	Amsterdam Schiphol
37,590,237	FRA	Frankfurt
36,931,687	DXB	Dubai International
33,405,025	SIN	Singapore Changi
27,047,687	BKK	Suvarnabhumi
25,806,476	ICN	Incheon International
24,807,575	MAD	Madrid-Barjas
23,513,659	LGW	London Gatwick
21,213,708	MUC	Munich
19,522,161	NRT	Narita International
19,279,618	KUL	Kuala Lumpur
18,875,650	FCO	Leonardo da Vinci
18,480,203	JFK	John F. Kennedy International
17,908,629	ZRH	Zurich
17,609,250	IST	Ataturk International
17,358,585	AYT	Antalya
17,193,513	TPE	Taoyuan International
16,740,823	BCN	Barcelona
15,735,979	YYZ	Toronto Pearson International
15,450,397	VIE	Vienna
15,433,774	CPH	Copenhagen
14,579,565	DUB	Dublin
14,336,794	BRU	Brussels
14,200,292	PMI	Palma de Mallorca
13,727,322	MIA	Miami International
13,706,325	MXP	Malpensa
13,097,282	MAN	Manchester

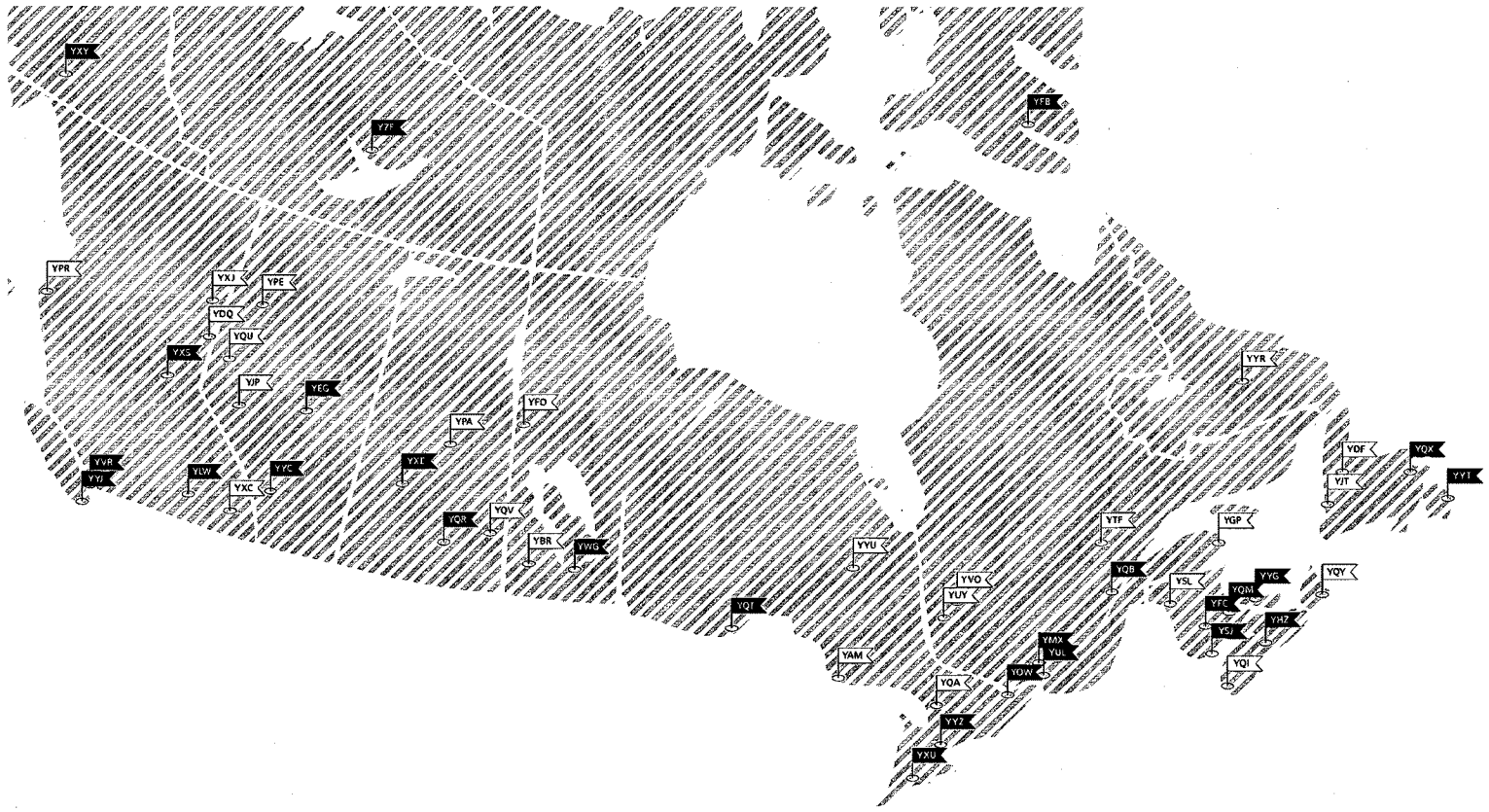


mapping the NAS

appendix B

NATIONAL AIRPORTS SYSTEM (NAS) AIRPORTS
EFFECTIVE APRIL 17, 2010

YLW Kelowna
YXS Prince George
YVR Vancouver
YYJ Victoria
YYC Calgary
YEG Edminton
YQR Regina
YXE Saskatoon
YWG Winnipeg
YXU London
YOW Ottawa
YQT Thunder Bay
YYZ Toronto
YUL Montreal
YMX Montreal
YQB Quebec
YFC Fredericton
YQM Greater Moncton
YSJ Saint John
YHZ Halifax
YYG Charlottetown
YQX Gander
YYT St. John's
YFB Iqaluit
YZF Yellowknife
YXY Whitehorse



locating rockcliffe airport

appendix C

AIR SERVICE OF THE NATIONAL CAPITAL REGION

HF2 Hope Field Ottawa/Manotick

NP3 Arnprior Airport

NR6 Carleton Place Airport

PL3 Kars/Rideau Valley Air Park

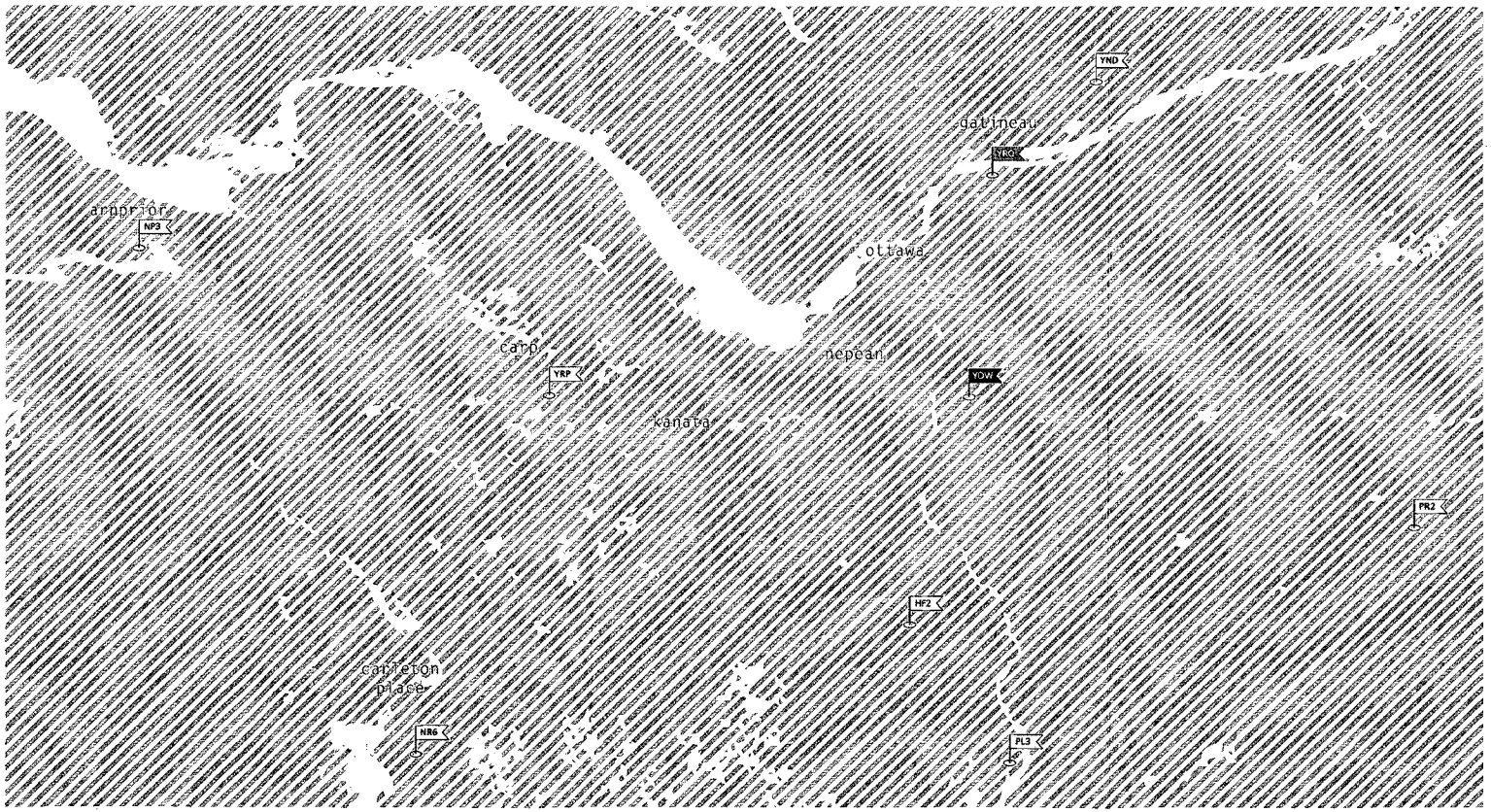
PR2 Ottawa/Embrun Airport

YND Ottawa/Gatineau Airport

YRO Ottawa/Rockcliffe Airport

YRP Ottawa/Carp Airport

YOW Ottawa International Airport



sizing the strip

appendix D

LARGE

031 London Heathrow Airport

032 Paris Charles de Gaulle

033 Hong Kong International

034 Amsterdam Schiphol

035 Frankfurt Airport

MEDIUM

036 Toronto Pearson International

037 Ottawa International

038 Iqaluit Airport

039 Vancouver International

040 Montreal Pierre Elliott Trudeau

SMALL

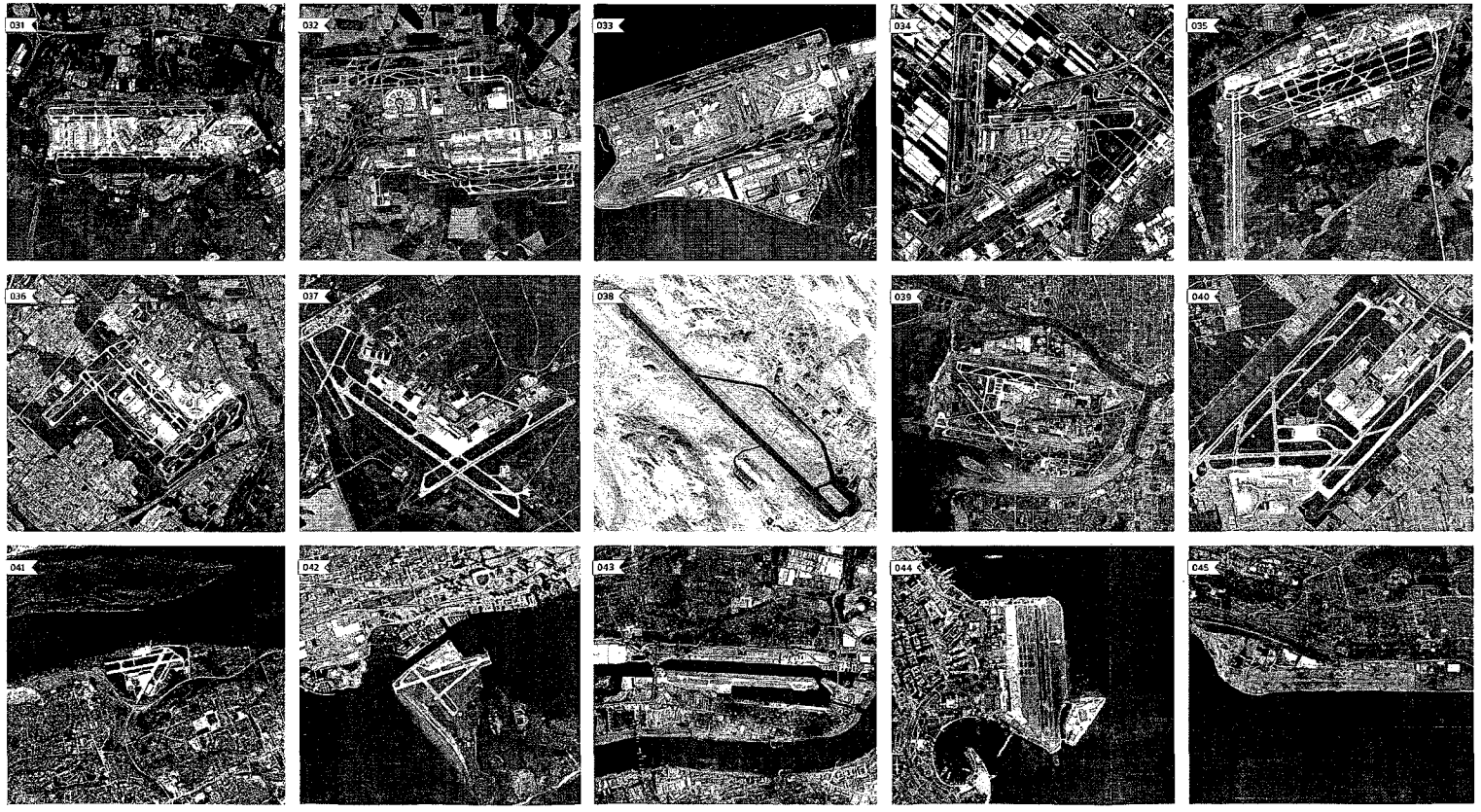
041 Ottawa Rockcliffe

042 Toronto Billy Bishop

043 London City Airport

044 Rio De Janeiro Santos Dumont

045 Dundee Airport Scotland



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