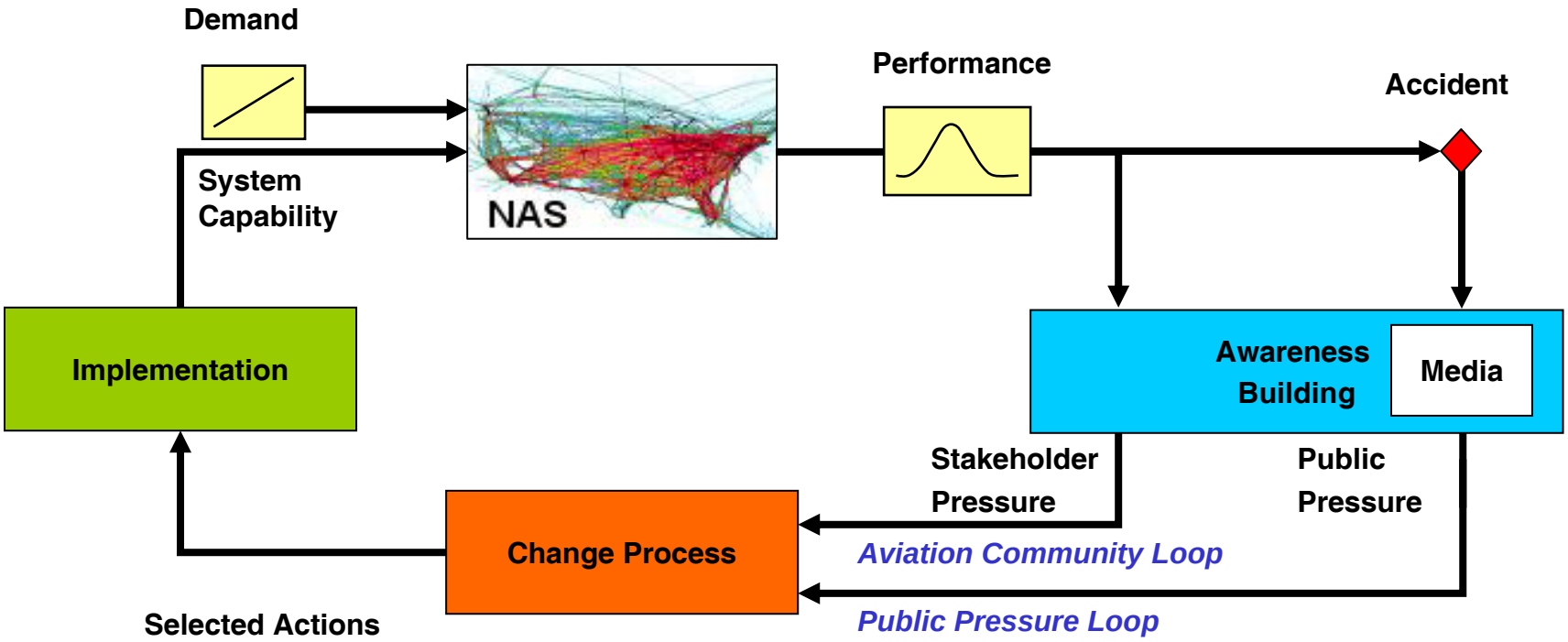
Air Transportation System Transition:
Response to Capacity Constraints

Aleksandra Mozdzanowska
and
R. John Hansman

What are the barriers to transitioning the capability of the system to meet future demand?

Historically System Transition was Driven by Safety Concerns

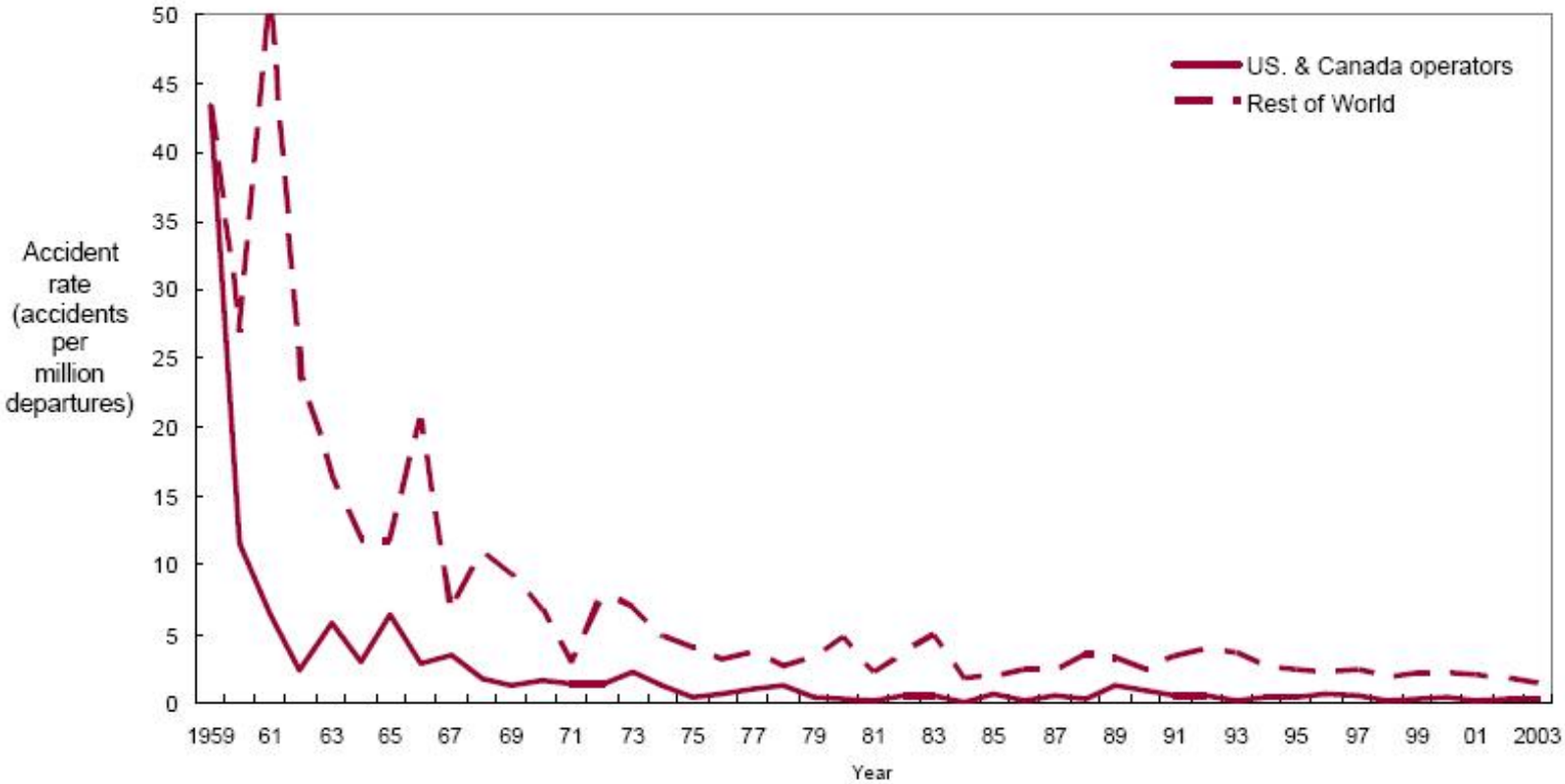


- **Radios (1930s)**
- **Airport control (1930s)**
- **Enroute control (1930s)**
- **ILS (1940s)**
- **Positive Radar Control Grand Canyon (1955)**
- GPWS Dulles (1974)
- TDWR Dulles (1985)
- TCAS Los Cerritos (1986)
- EGPWS Cali Columbia (1994)

Safety is no Longer the Primary Transition Driver

U.S.A. and Canadian Operators Accident Rates

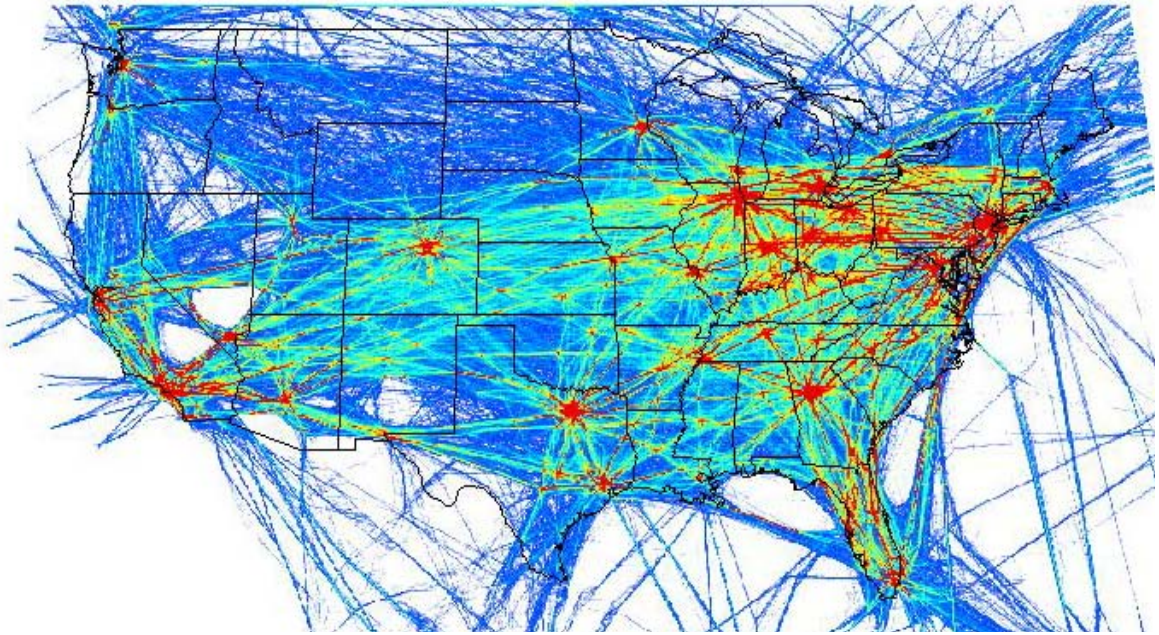
Hull Loss and/or Fatal accidents - Worldwide Commercial Jet Fleet - 1959 through 2003



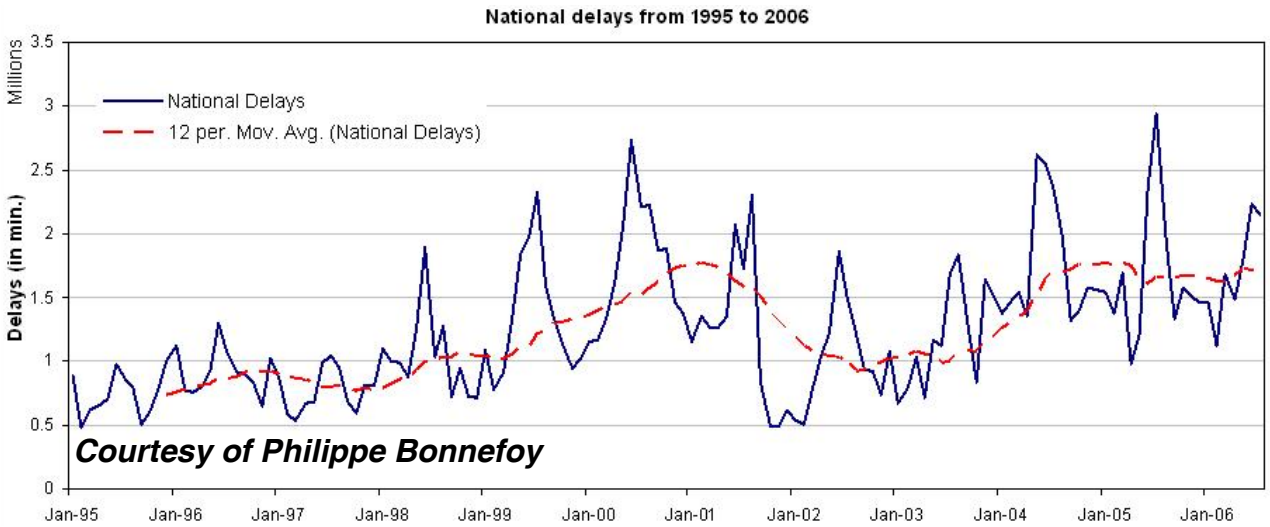
2003 STATISTICAL SUMMARY, MAY 2004

BOEING

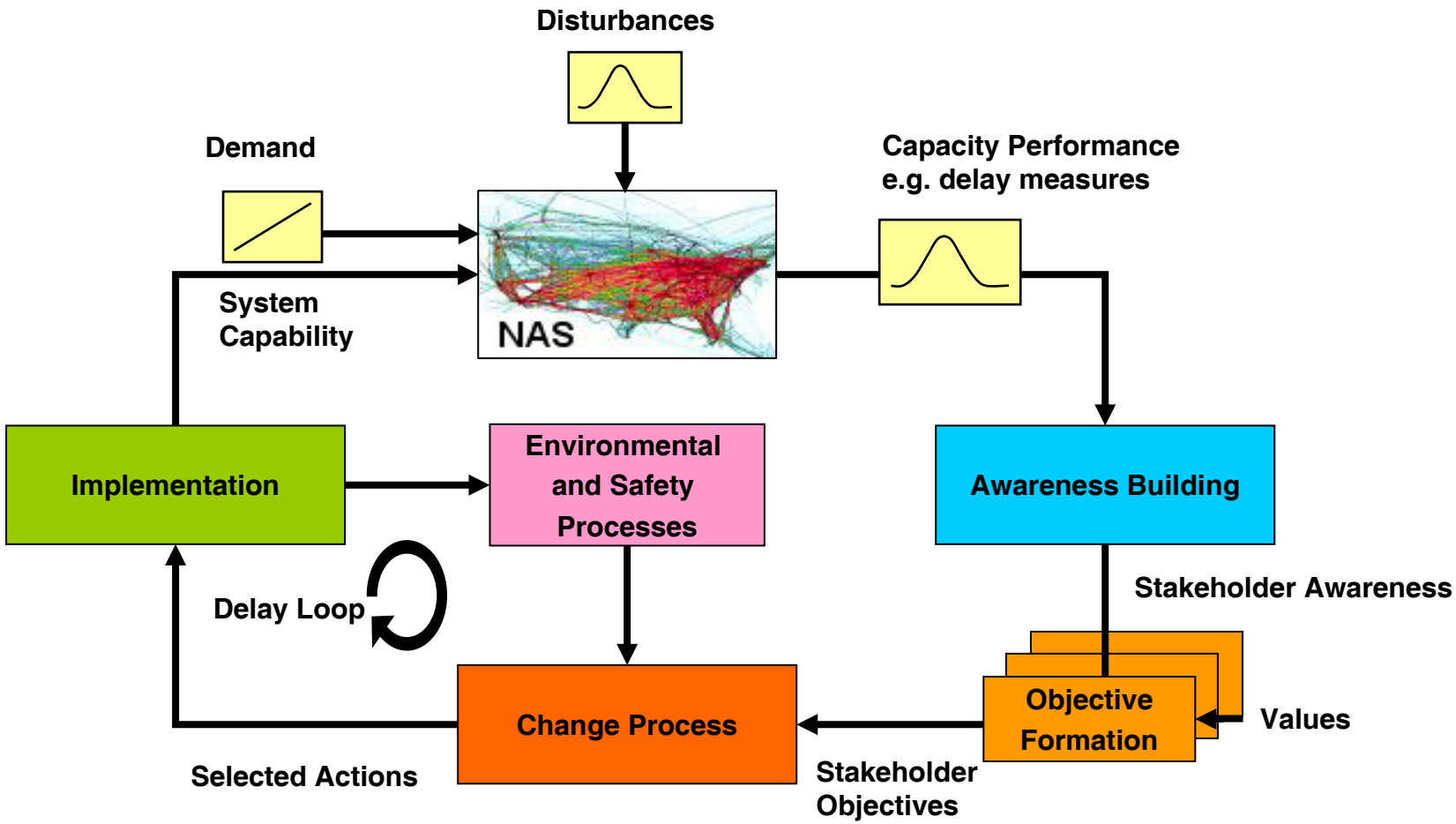
How will System Adapt when Capacity is the Change Driver?



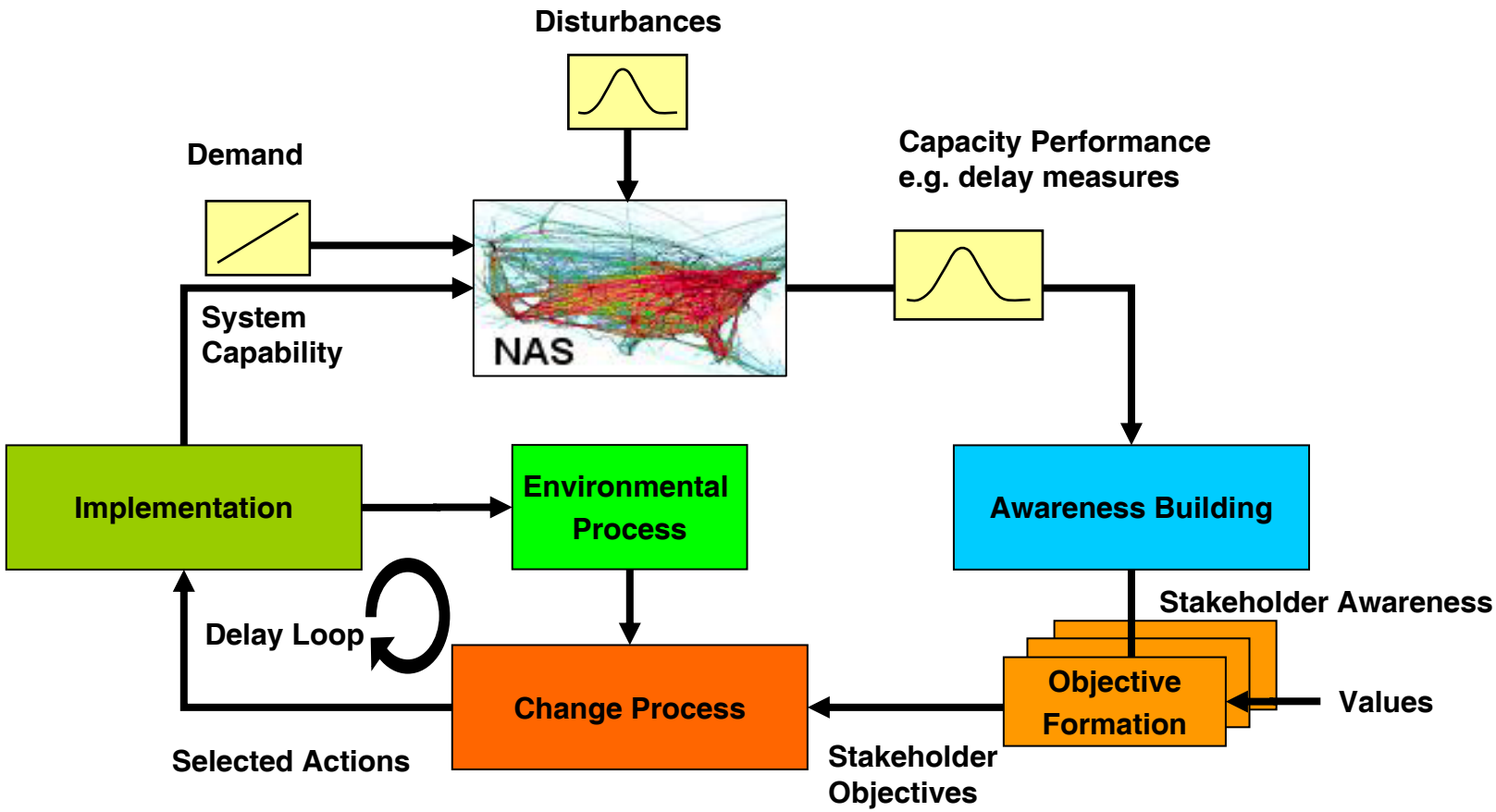
- Options:
  - Build runways
  - Improve efficiency of operations
  - Manage demand



Environmental and Safety Issues have Emerged as Transition Barriers

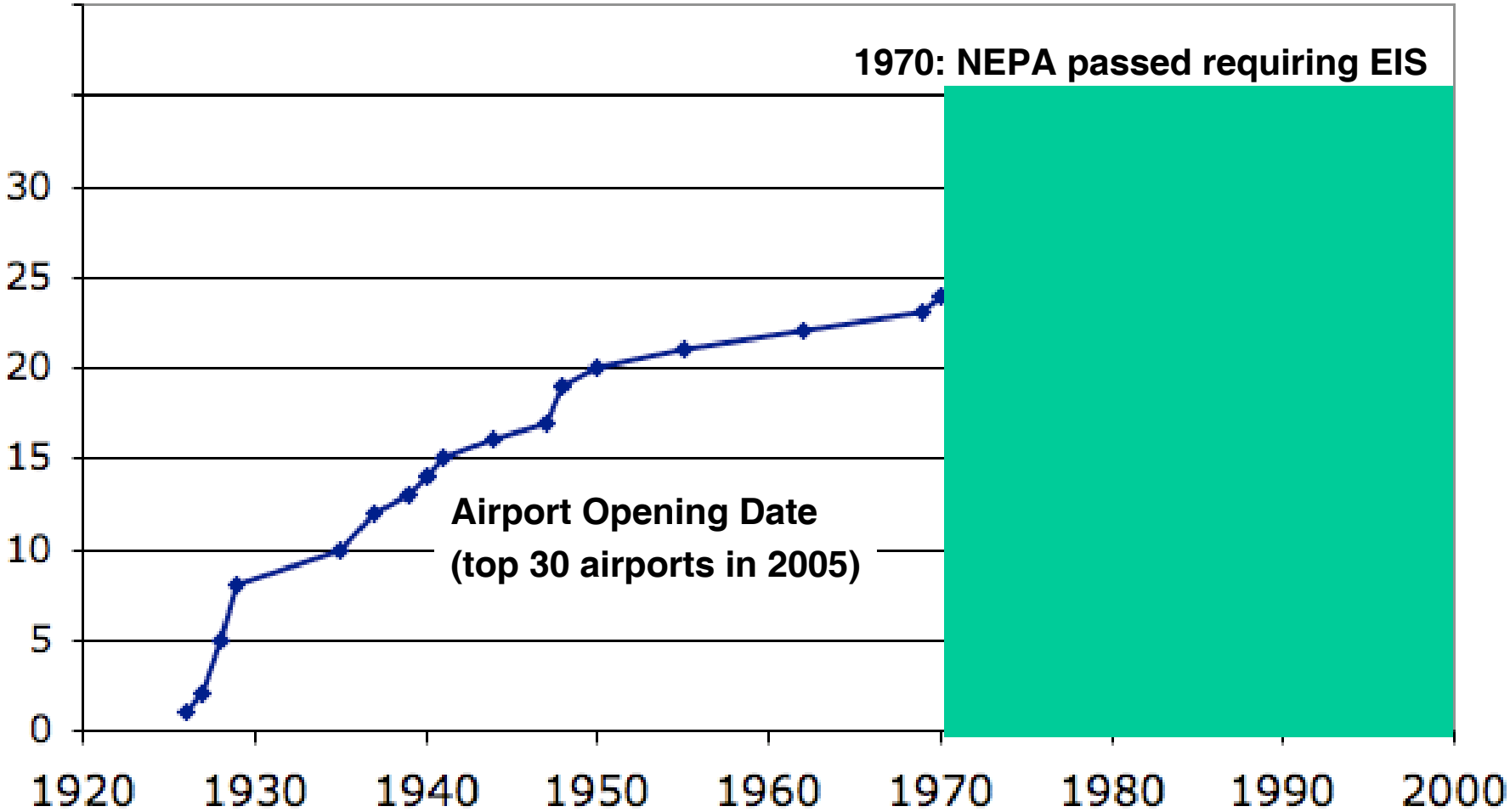


Environmental Process



- Environmental process provides a mechanism for disenfranchised stakeholders to block implementation

Airport Construction in Key Areas has Slowed



Community Groups Against Runways

North America (By State/Province)

- US-Citizens Aviation Watch (U.S.A.)
- Sedona Noise Abatement (Sedona, Arizona, U.S.A)
- Alliance for a New Moffett Field (Mountain View, Sunnyvale, California, U.S.A)
- Citizens Against Airport Pollution (CAAP) (San Jose, California, U.S.A.)
- El Toro Naval Air Station--No Airport (San Diego, California, U.S.A) (Has an extensive library.)
- PANIC Peninsula Aircraft Noise/Safety Information Commitee (Rancho Palos Verdes, California, U.S.A.)
- People Over Planes, Inc. (Pleasant Hill, California, U.S.A)
- San Francisco Airport/Community Roundtable (San Francisco, California U.S.A.)
- UPROAR (San Francisco, California U.S.A.)
- The Van Noise (Nuys) Airport Citizens Advisory Group (Van Nuys, California U.S.A)
- Alliance of Residents Concerning O'Hare (Chicago, Illinois, U.S.A.)
- Communities Against Runway Expansion (Boston, Massachusetts, U.S.A.)
- Save our Heritage (Near Hanscom Field, Massachusetts, U.S.A.)
- ShhAir (Concorde, Massachusetts, U.S.A)
- R.O.A.R (Minneapolis, St. Paul, Minnesota, U.S.A.)
- South Metro Airport Action Council (Minneapolis, Minn
- Stop Expansion of Solberg-Hunterdon Airport (Whitehou U.S.A)
- SAFE--Sane Aviation for Everyone (Rockaway, New Y
- Piedmont Quality of Life Coalition (Greensboro, North C
- RDU Noise Abatement Comittee (Raleigh/Durham Nort
- Olmsted Falls Airport Committee (OFAC) (Olmstead Fall
- Bucks Residents for Responsible Airport Management (Y U.S.A.)
- Citizens Concerned About Jet Noise (CCAJN) (Virginia B
- Citizens for Abatement of Aircraft Noise Washington Na International Airport (Washington D.C. & State of M

Seattle, Washington, U.S.A. Area

- CASE (Citizens Against Sea-Tac Expansion) (Seattle, Wash.)
- City of Burien, Wash
- City of Des Moines, Wash.
- City of Federal Way, Wash.
- City of Normandy Park, Wash.
- City of Tukwila, Wash.
- The Third Runway: **D**eadly, **E**xtravagent, **A**nd **D**ependent (individual) (Normandy Park, WA)
- Miller Creek, a Place of History, Peace, and Change (individual) (Normandy Park, WA)
- Preserve Our Islands (on fill quarry on Maury Island for third runway fill)
- Seattle Council on Airport Affairs (Seattle, Wash.)
- Seattle RCAA (Formerly The Seattle Aircraft Noise Group)(Seattle-Tacoma, Wash.)

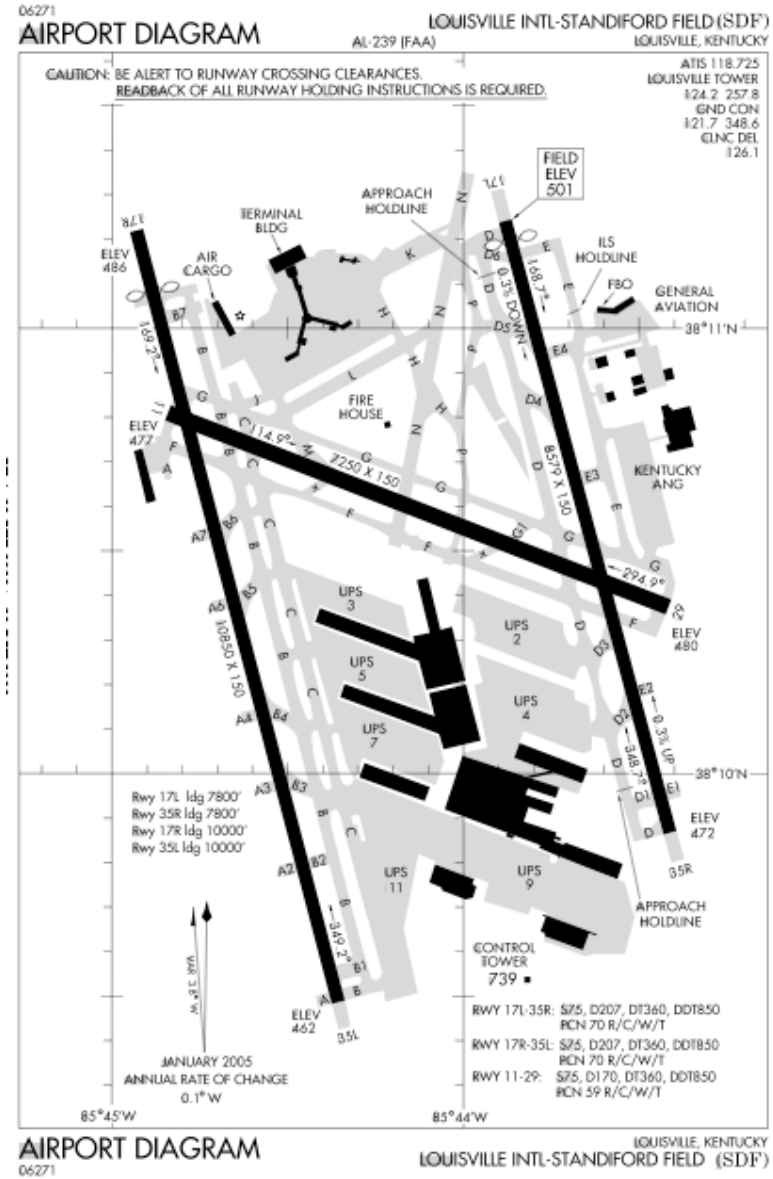
Airports Find Environmental Considerations Limit Expansion

- In a GAO survey of top 50 airports
  - 92% said it is more difficult balancing environmental concerns with airport operations than it was in 1989
    - 58% noise
    - 24% water
    - 16% local land and air
  - 88% said NEPA contributed to delaying runway projects
    - 72% of projects were delayed due primarily to environmental issues

Source: GAO Aviation and the Environment 2000

Breaking the Change Process and Implementation Cycle

- It is possible to end the loop between implementation and change process at a high cost
- Example: Louisville Runway
  - Runway
    - $447 M
  - Mitigation within 65 DNL
    - $350 M
- ORD expansion project
  - $400 million cost over runs due to community opposition



Airport Expansion Projects will not Provide Capacity to Meet Demand

Airport code	Airport name	Percentage of operations delayed	OEP new runway project (date completion/ capacity benefit)
EWR	Newark	8.8%	
ATL	Atlanta	6.8%	2006 / + 33%
LGA	LaGuardia	6.7%	
ORD	Chicago	5.8%	?
PHL	Philadelphia	5.0%	2008 / ?
JFK	Kennedy	4.0%	
BOS	Boston	2.8%	2006 / ?
SFO	San Francisco	2.6%	
PHX	Phoenix	2.4%	
IAH	Houston	2.0%	
IAD	Dulles	1.9%	2008 / +12%
LAS	Las Vegas	1.5%	
CLT	Charlotte	0.9%	
DTW	Detroit	0.8%	
MSP	Minn./St. Paul	0.7%	
DCA	Reagan National	0.6%	
DFW	Dallas/Ft.Worth	0.6%	
CVG	Cincinnati	0.6%	
MIA	Miami	0.4%	
SAN	San Diego	0.4%	
BWI	Balt.-Wash. Intl	0.4%	
MEM	Memphis	0.3%	
SEA	Seattle	0.3%	2008 / + 46%
DEN	Denver	0.3%	
LAX	Los Angeles	0.3%	2008 / Not Avail.
MCO	Orlando	0.3%	
SLC	Salt Lake City	0.2%	
TPA	Tampa	0.2%	
STL	St. Louis	0.1%	2006 / + 48%
PIT	Pittsburgh	0.1%	

ATL: 1980s-2006

PHL: 2003-?

BOS: 1969-2006(?)

IAD: 1990s-?

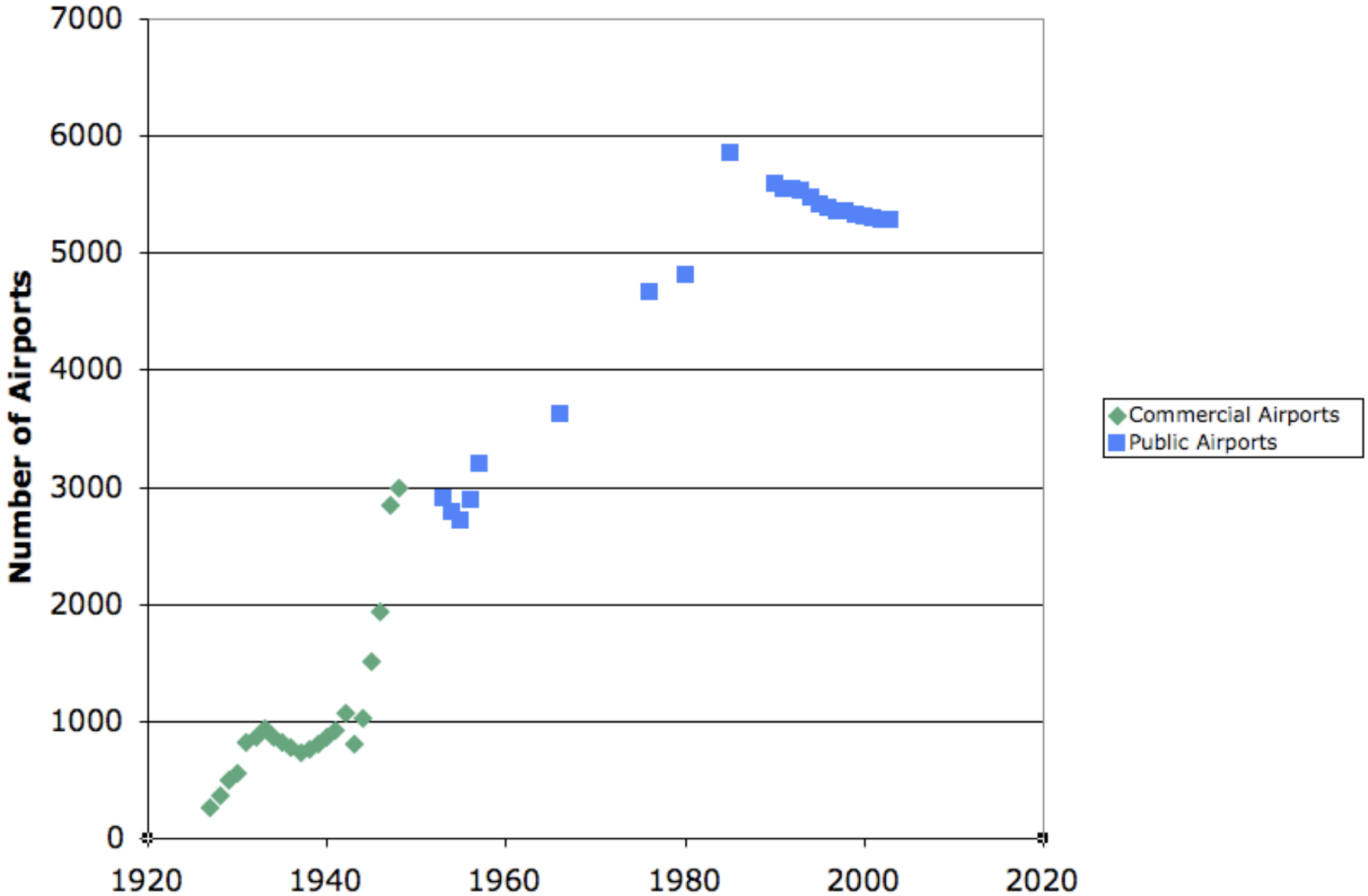
SEA: 1967-2008(?)

LAX: 1990s-?

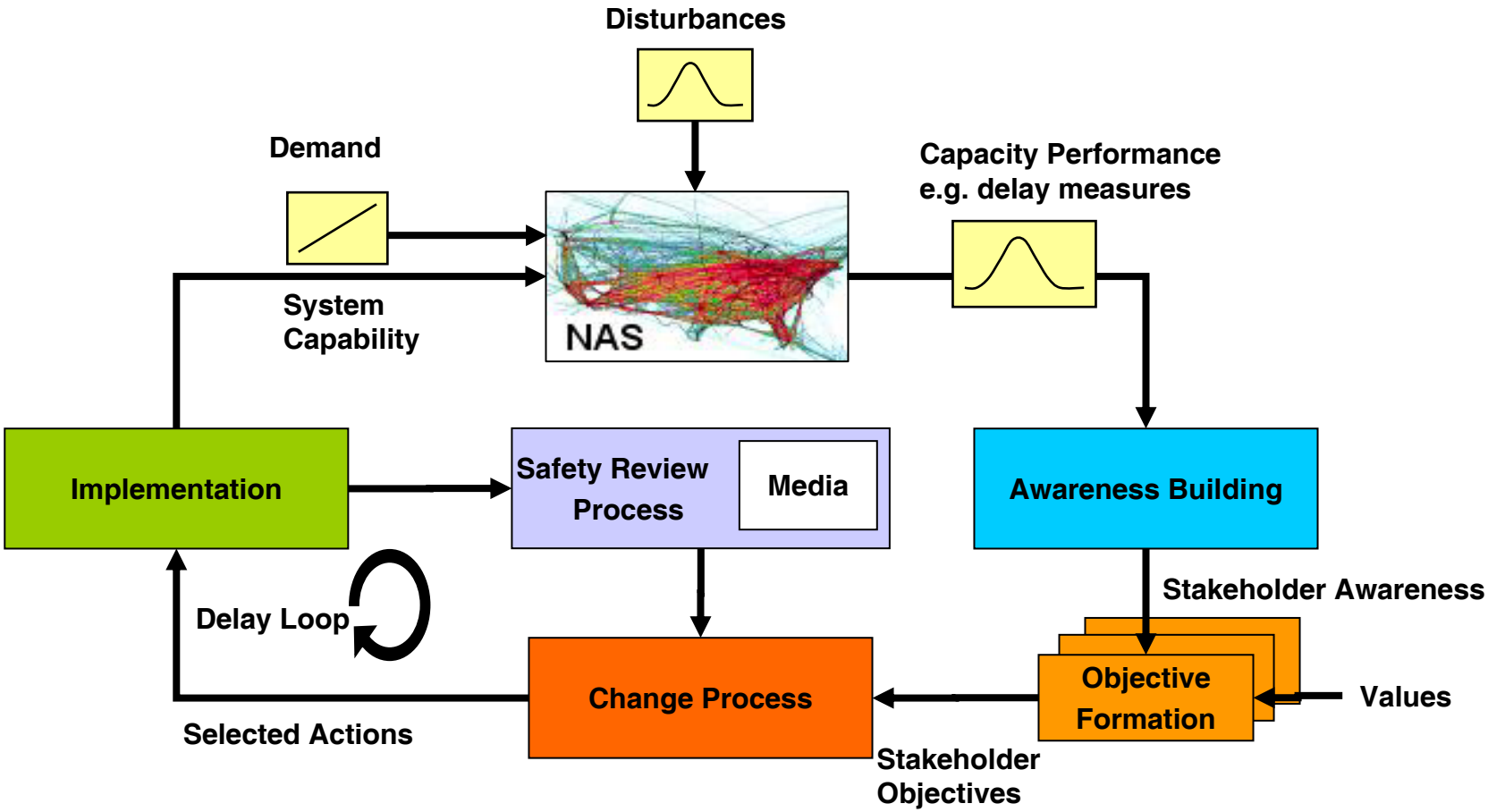
STL: 1998-2006

Source: OPSNET and OEP (Curtsey of Philippe Bonnefoy)

Decreasing Number of Public Airports



Safety Veto Process



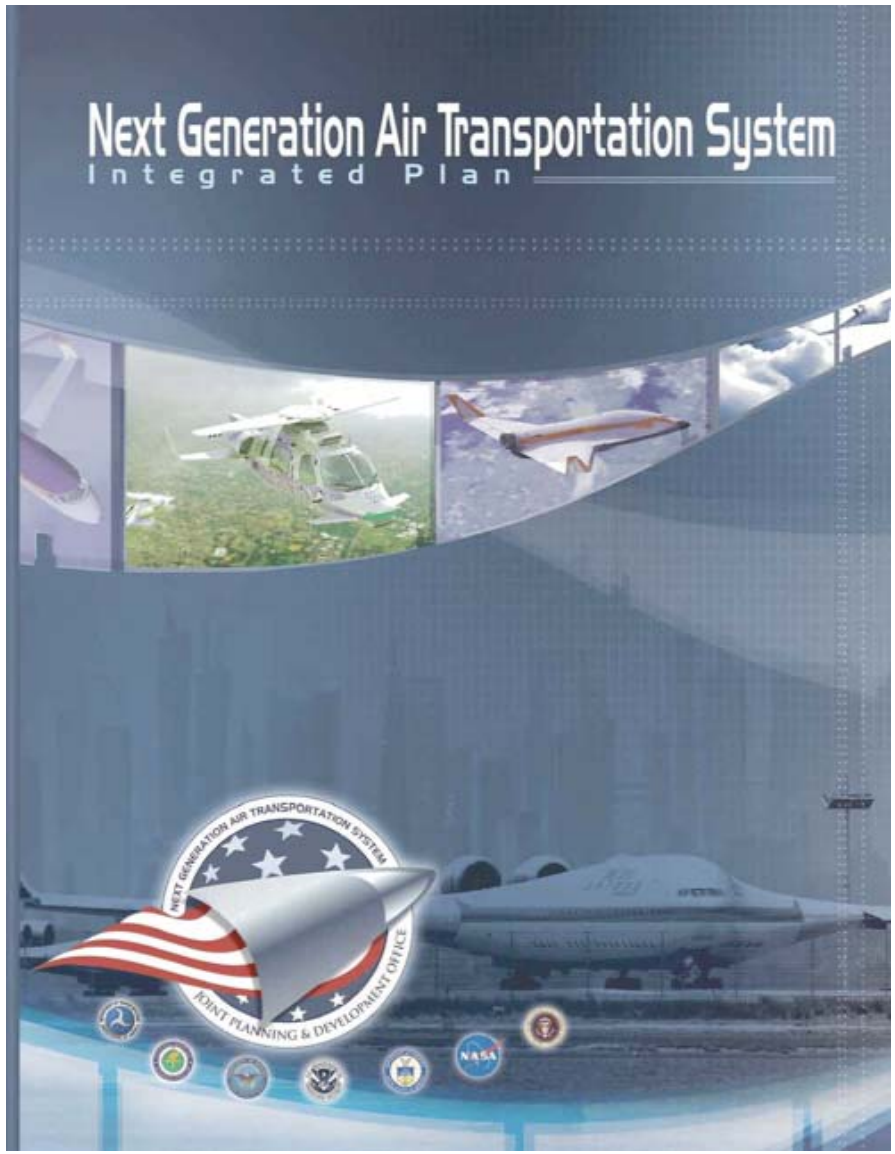
- Safety and media process provides a mechanism for concerned stakeholders to block implementation

Stakeholders can Use Safety to Delay Implementation

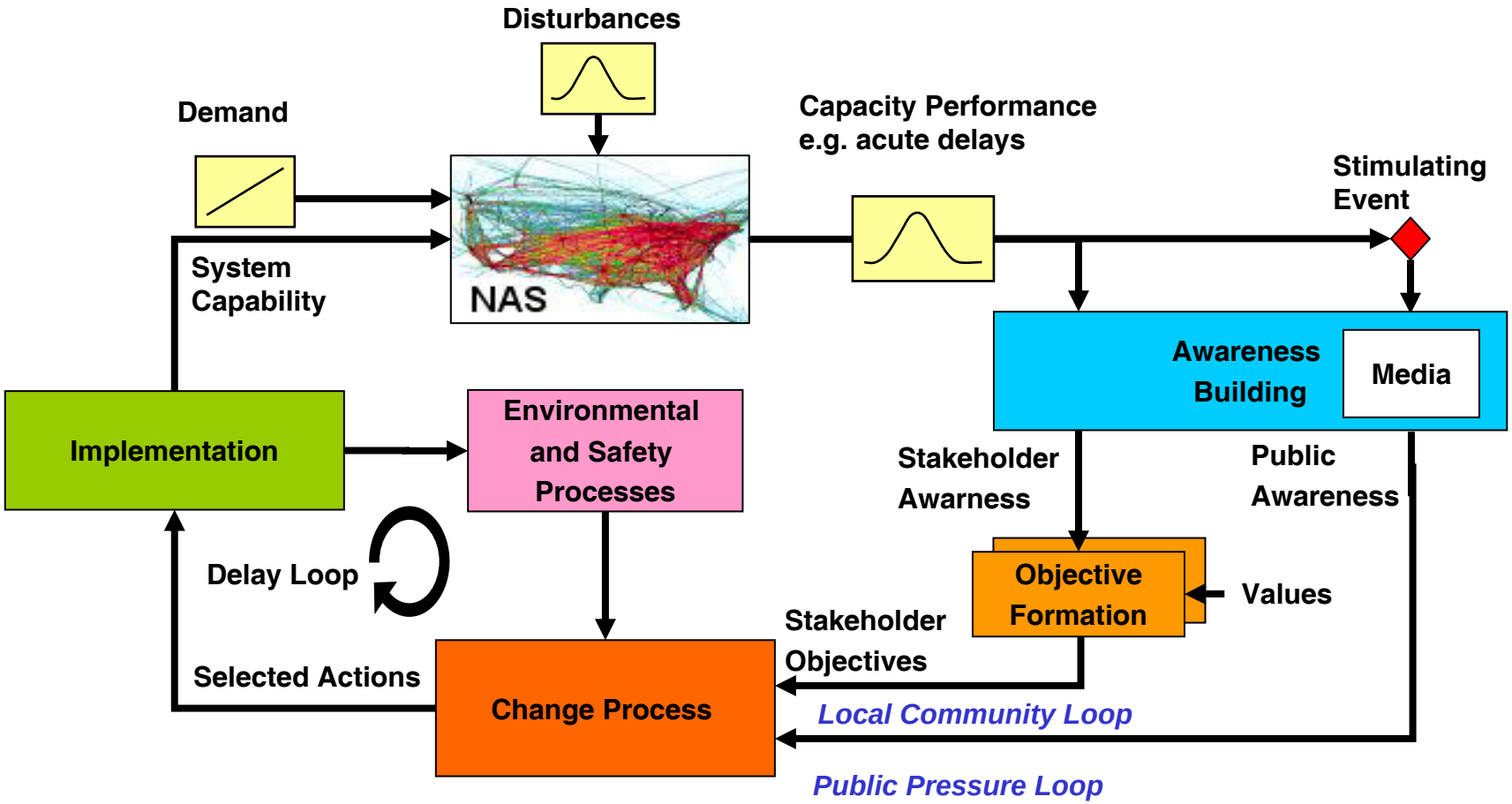
- Standard Terminal Automation Replacement System (STARS) was scheduled for implementation starting in 1998
- The Professional Airways System Specialists questioned the safety of the technology interface and caused increased costs and delays
  - Done as part of contract renegotiation
  - $940m contract -> $1.4b to improve interface
  - Implementation began in 2002

Implications for NGATS

- NGATS requires significant transformation of the National Airspace System and significant changes to roles and responsibilities
- Safety concerns are likely to be a major barrier to NGATS implementation
  - Controllers would be negatively impacted if separation responsibilities moved to aircraft and are likely to oppose the change

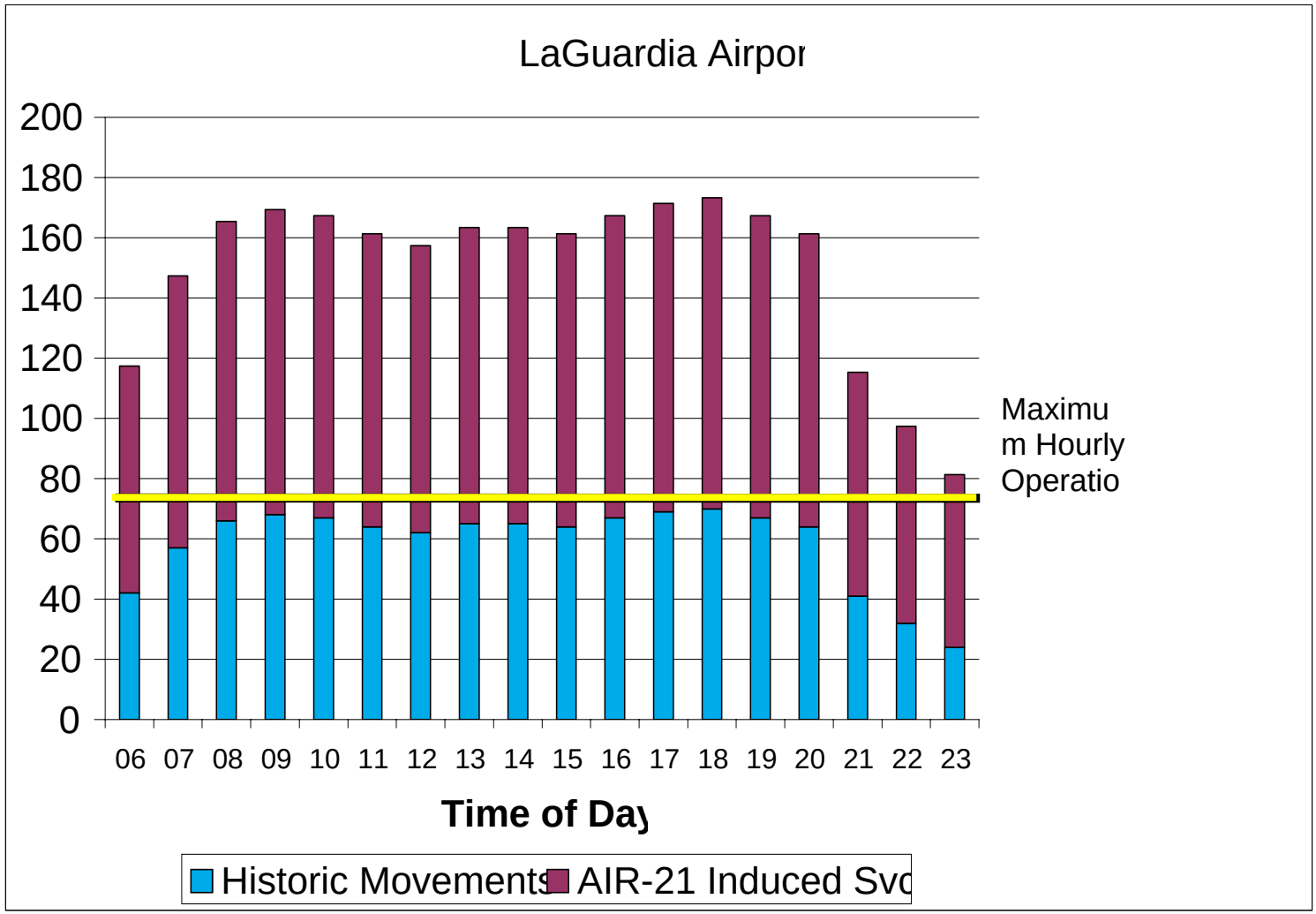


Consequences of Public Awareness of Capacity Limits



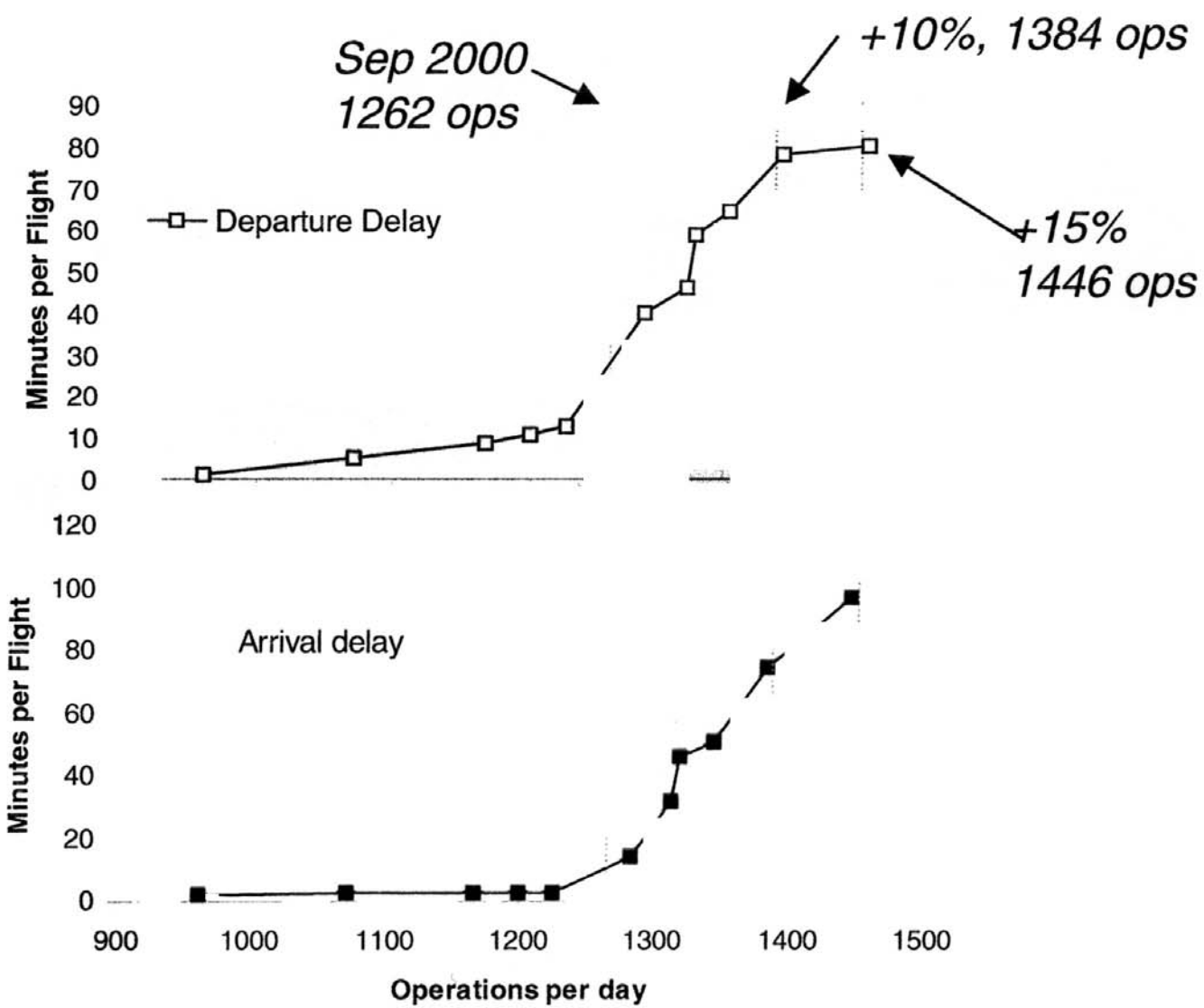
- What is a stimulating event for capacity issues?
- Implementation time is too long to improve system capability

LGA Impact of Slot Restriction Removal (Air 21)



Source: William DeCota, Port Authority of New York

Flight Delays at LGA

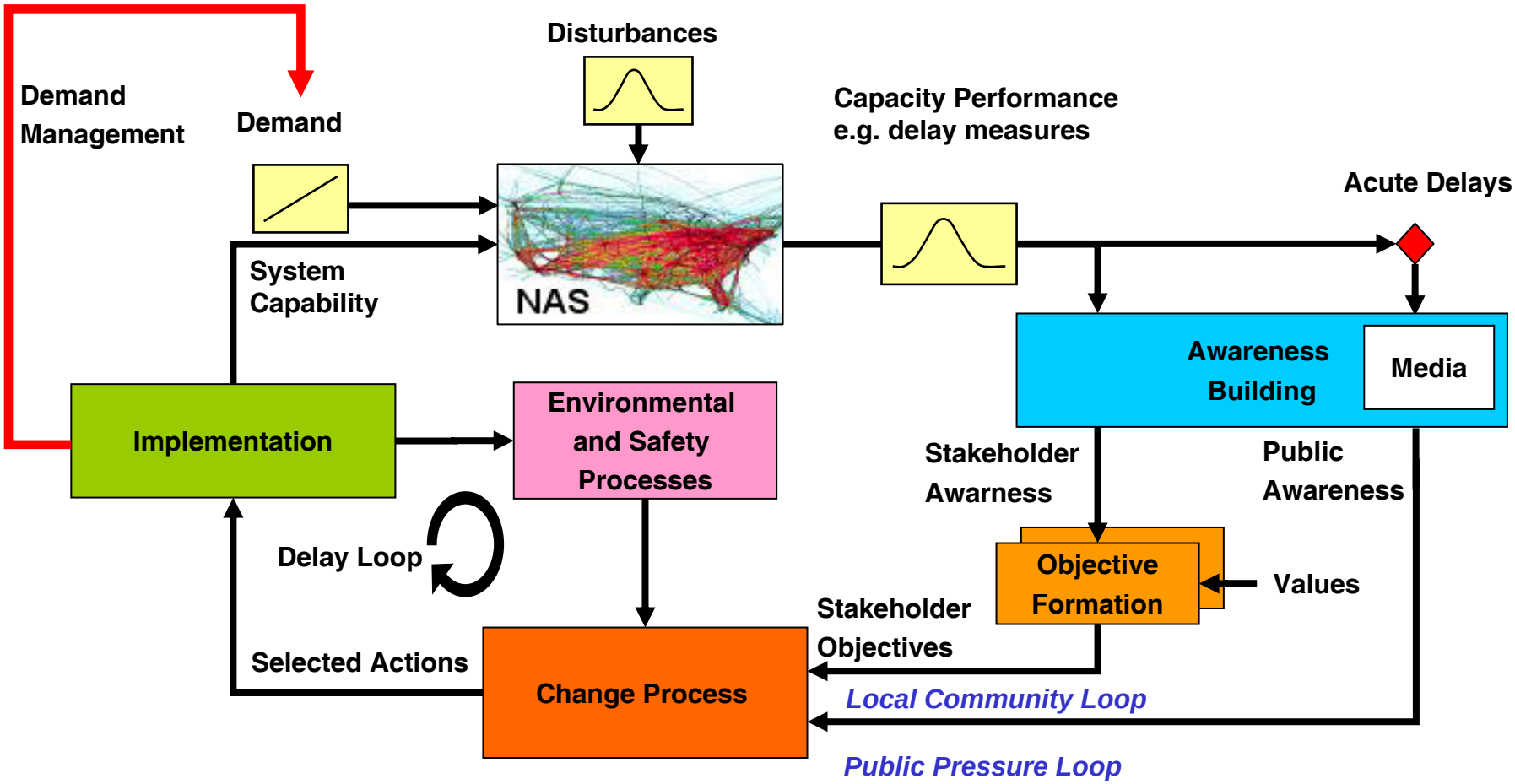


Departure Delay: (Actual - scheduled pushback time)+ (taxi-out time minus 10 minutes)

Arrival Delay: time spent waiting for proper separation from previous aircraft.

Source: William DeCota, Port Authority of New York

Demand Management is the only Rapid Alternative



Conclusion

- System capability enhancement is significantly limited by environmental and safety delay loops
  - Limited opportunity to build more runways
  - Technology and procedure implementation may be difficult
- More demand management is likely
  - How is demand management best implemented?
  - What are the consequences of demand management?
  - Is there a way to reframe the need for capacity enhancement as a safety problem?
  - Are there other alternatives?