



**30**<sup>th</sup> Annual **INCOSE**  
international symposium

Virtual Event  
July 20 - 22, 2020

# Systems Engineering Evidence in Commercial Kitchens

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# The Inspiration





## THE GASTRONAUT'S MENU

### Amuse-Bouche

#### A Tin of Sin:

\*Imperial Osetra Caviar  
with Peekytoe Crab and Cucumber Rilette  
*L. Aubrey Fils, 1er Cru, Jouy-les-Reims, Champagne, France (N.V.)*

\*Carpaccio of Herb-Crusted Elysian Fields Baby Lamb Loin  
with Caesar Salad Ice Cream  
*Domaine Maubernard, Rosè, Bandol, France (2018)*

Seafood Sausage with Tomato-Tarragon Butter  
*La Vizcaina, La Del Vivo, Bierzo, Spain (2016)*

\*Blackened Heart of Wagyu Ribeye  
with Grilled Romaine and Bone Marrow Custard  
*Avennia, Syrah, Arnaut, Bouchey Vineyard, Yakima Valley  
Washington (2016)*

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A Lilliputian Mandarin and Vanilla Dreamsicle

Our Chocolate-Hazelnut Mousse Napoleon  
*Toro Albalá, Pedro Ximénez, Don PX, Gran Reserva  
Montilla-Moriles, Spain (1990)*

-or-

A selection of cheese from Cameron, our "Cheese Whiz"

## THE GOOD EARTH OUR VEGETARIAN CREATIONS

### Amuse-Bouche

Sweet Pea Panna Cotta with Baby Radishes, Snow Peas  
and Chilled Pea Flower Consommé  
*Alfred Merkelbach, Riesling, Auslese, Ürziger Würzgarten, Mosel  
Germany (2016)*

Our Garden Green Bean Tartare with Tomato Vinaigrette  
*Alzinger, Riesling, Hollerin, Smaragd, Wachau, Austria (2016)*

Summer Vegetable Raviolis  
with Roasted Sweet Corn and Chanterelle Mushrooms  
*Pahlmeyer, Chardonnay, Napa Valley, California (2017)*

A Filet of Beet with Creamed Spinach, Pomme Soufflé  
and Beurre Rouge  
*G.D. Vajra, Dolcetto d'Alba, Coste & Fassati, Piedmont, Italy (2017)*

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Global Warming

A Lemon Tart Reincarnated  
*Domaine des Baumard, Quarts-de-Chaume  
Loire Valley, France (2012)*

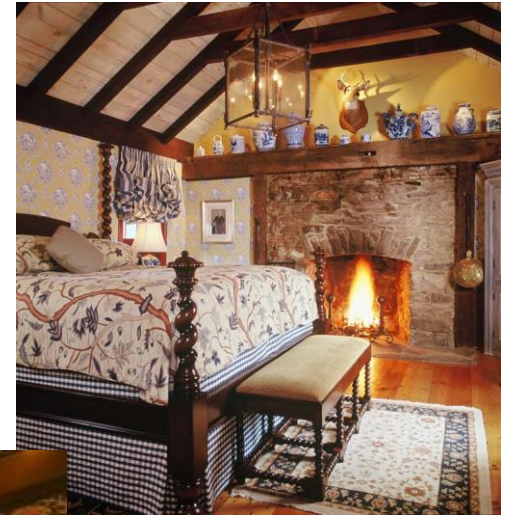
-or-

A selection of cheese from Cameron, our "Cheese Whiz"



# The Inn at Little Washington

- Remodeled from a garage
  - Designed by Joyce Conway Evens
- The Inn
- The restaurant
  - Michelin three stars
  - Eat in the kitchen option





# Commercial Kitchens

- Typical commercial kitchen décor
- Exceptions for when open to front





# Inn at Little Washington Kitchen



Not what I expected!

# Systems Engineering Thinking?





# Systems Engineering Thinking?

- Concepts
  - Fine dining
  - Fast food
  - Take out
  - Cuisine
  - Which meals
  - Target customer
  - Etc.





# Systems Engineering Thinking?

- Concepts
- Functions
- Cook
- Store
- Maintain
- Serve
- Manage



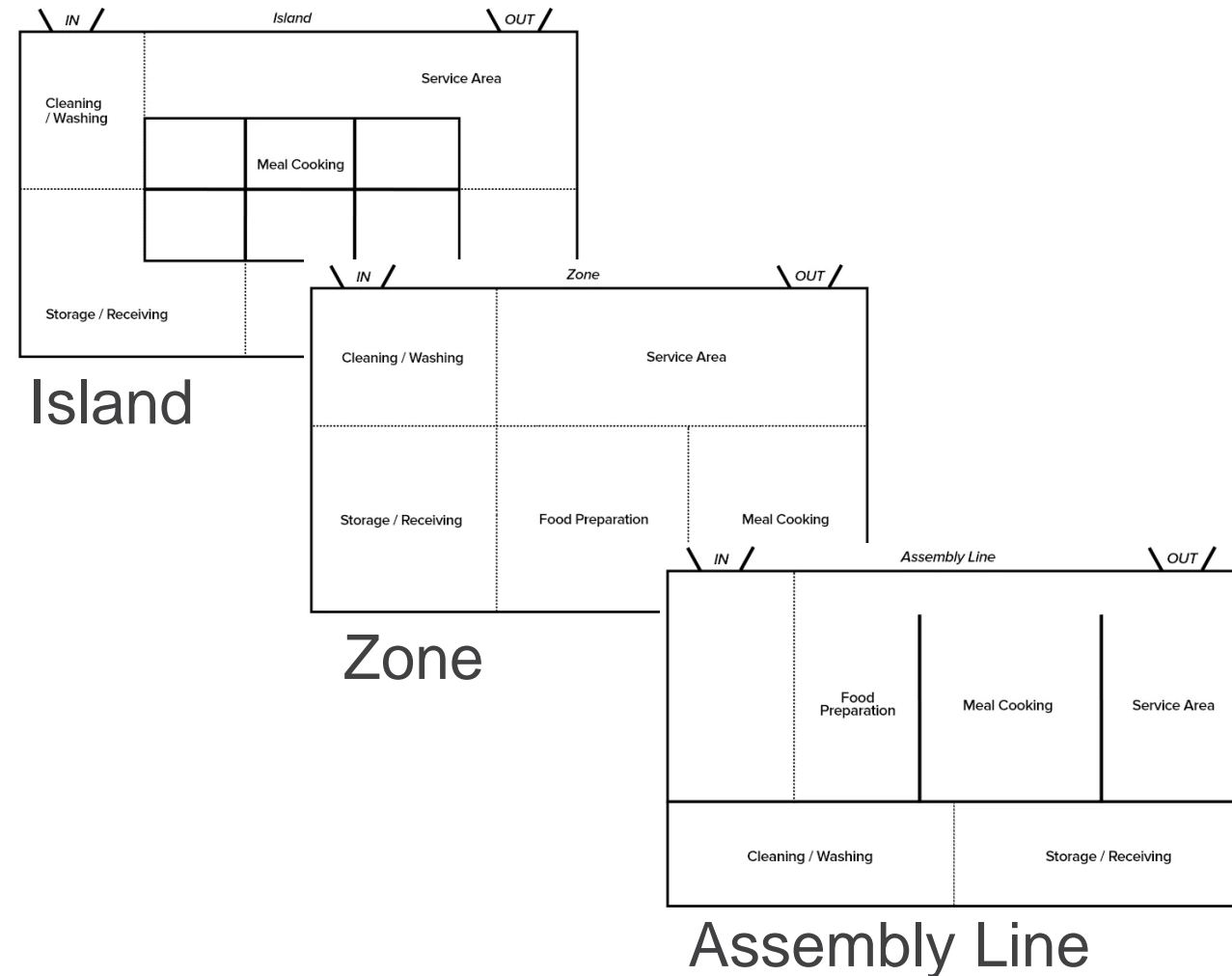
# Systems Engineering Thinking?

- Concepts
- Functions
- Requirements
- Cuisine
- Quality
- Volume
- Speed
- Safety
- Laws
- Human interface
- External interfaces
- Etc.



# Systems Engineering Thinking?

- Concepts
- Functions
- Requirements
- Architecture





# Systems Engineering Thinking?

- Concepts
- Functions
- Requirements
- Architecture
- Models
- Ray Kroc for speed
- Student concept

Comparison

Current Facility Layout

New! Facility Layout





# Systems Engineering Thinking?

- Concepts
- Functions
- Requirements
- Architecture
- Models
- Integration
- Components
- Humans
- Front end
- Business
- Facility
- Utilities
- Supply chain
- Etc.



# Systems Engineering Thinking?

- Concepts
- Functions
- Requirements
- Architecture
- Models
- Integration
- Verification
- Equipment tests
- Licensing
- Test runs
- Ratings



# Systems Engineering Thinking?

- Concepts
- Functions
- Requirements
- Architecture
- Models
- Integration
- Verification
- Validation
- Market surveys
- Trial openings
- Business volume is ultimate validation



# Variations on the Theme

- Fast Food
- Cafeterias
- Hotels
- Schools
- Food trucks
- Boats
- Planes



# Fast Food – Functional Sequence Change



- Restaurant sequence: Order, cook, eat, pay, leave.
- Fast food: order, pay, cook, pick up, eat, leave. Or, leave then eat.
- NJTP BK: cook, put out, pick up, pay, eat.
  - Kitchen staff must monitor supply and respond to orders if missing on shelves



# Menu Driven Design

- Pizza
- Octopus
- Dumplings
- Steaks





# Sandwich Shop Allocation Variation

- Customer is more involved in preparation and decisions are made while in progress





# Cafeteria - Time Line

- Longer between preparation and serving
- Impacts menu
- Impacts kitchen components





# School Cafeterias

- Requirements may have more specific details
  - Number and types of equipment
- Involvement of employees
  - More early validation



# Hotel Requirement drivers

- Size of hotel
- Clientele
- Breakfast only to support of banquets
- Dinner support for extended stay guests





# Food Truck Considerations

- Durable, non-slip, inflammable floors like commercial grade laminate or vinyl
- Proper ventilation in the form of a hood fan and roof vent, with additional windows if you can swing it
- Room for staff to move around freely while carrying hot pots and pans
- Easy access to inventory and ease of transition between workstations
- Emergency exits

-Regaudie, 2019?



# At Sea

- Safety – fuel selection
- Motion control
  - Aegis max turn test during lunch
  - Sailboat galleys
- Submarine Space





# Airplane Galley





# Kitchen External Integration

- United employee kitchen at Denver International
- Exhaust upwind from terminal air intake
- Grill odors strong in the terminal





# So what?

- Even commercial kitchens reflect the same considerations as classic systems engineering
- We can learn from other disciplines and products
- We can also be able to speak their language to be able to apply better SE practices where needed.

# Questions?

