Systems Engineering Approach to Workforce Development

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Systems Engineering Definition
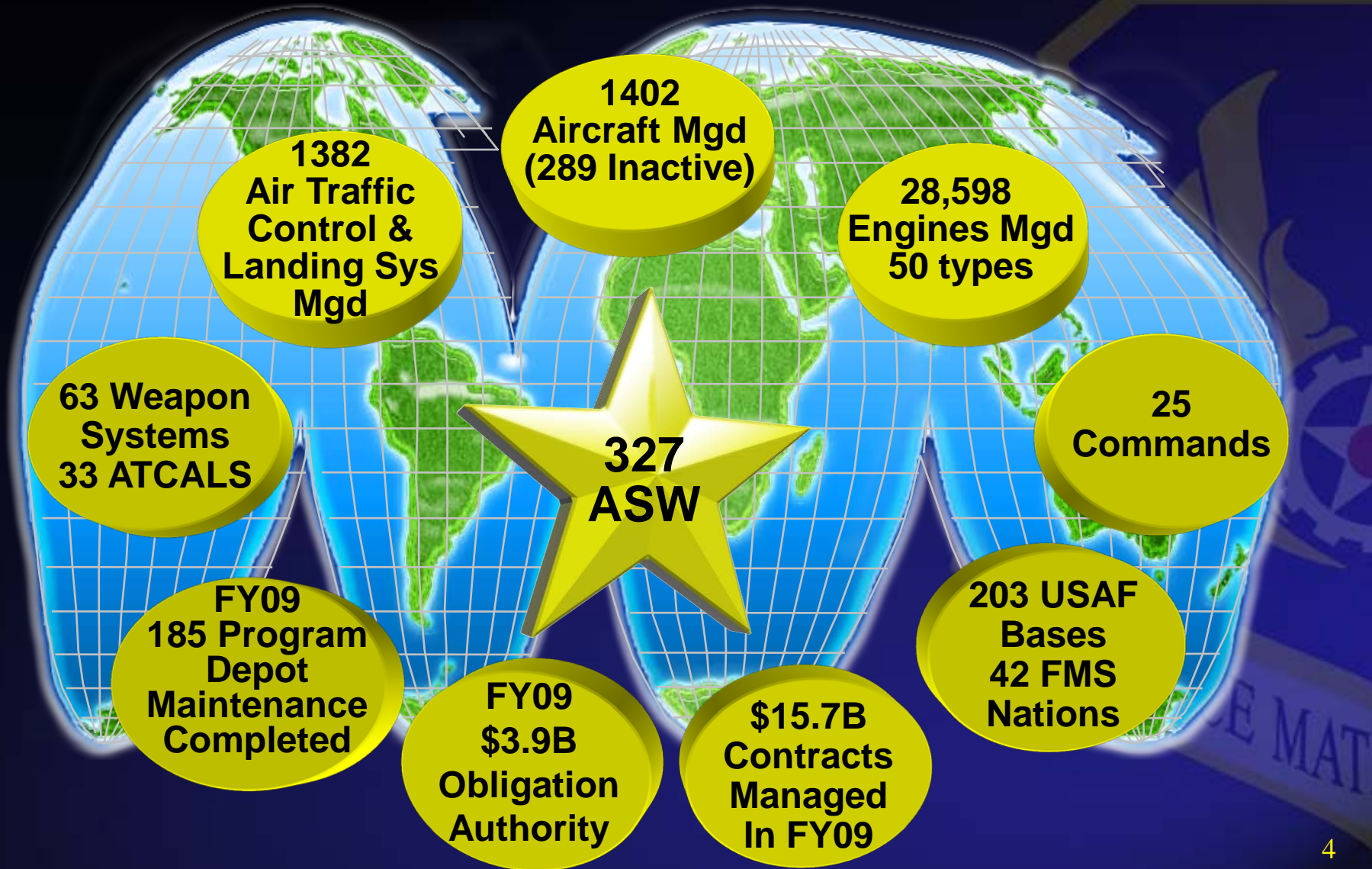
- Systems engineering can be thought of as the problem-independent principles and methods related to the successful engineering of systems.

- DOD Definition: SE is an interdisciplinary approach encompassing the entire technical effort to evolve and verify an integrated and total life cycle balanced set of system, people, and process solutions that satisfy customer needs.

- INCOSE Definition: Systems Engineering is an interdisciplinary approach and means to enable the realization of successful systems…Systems Engineering integrates all the disciplines and specialty groups into a team effort forming a structured development process that proceeds from concept to production to operation.

So What?

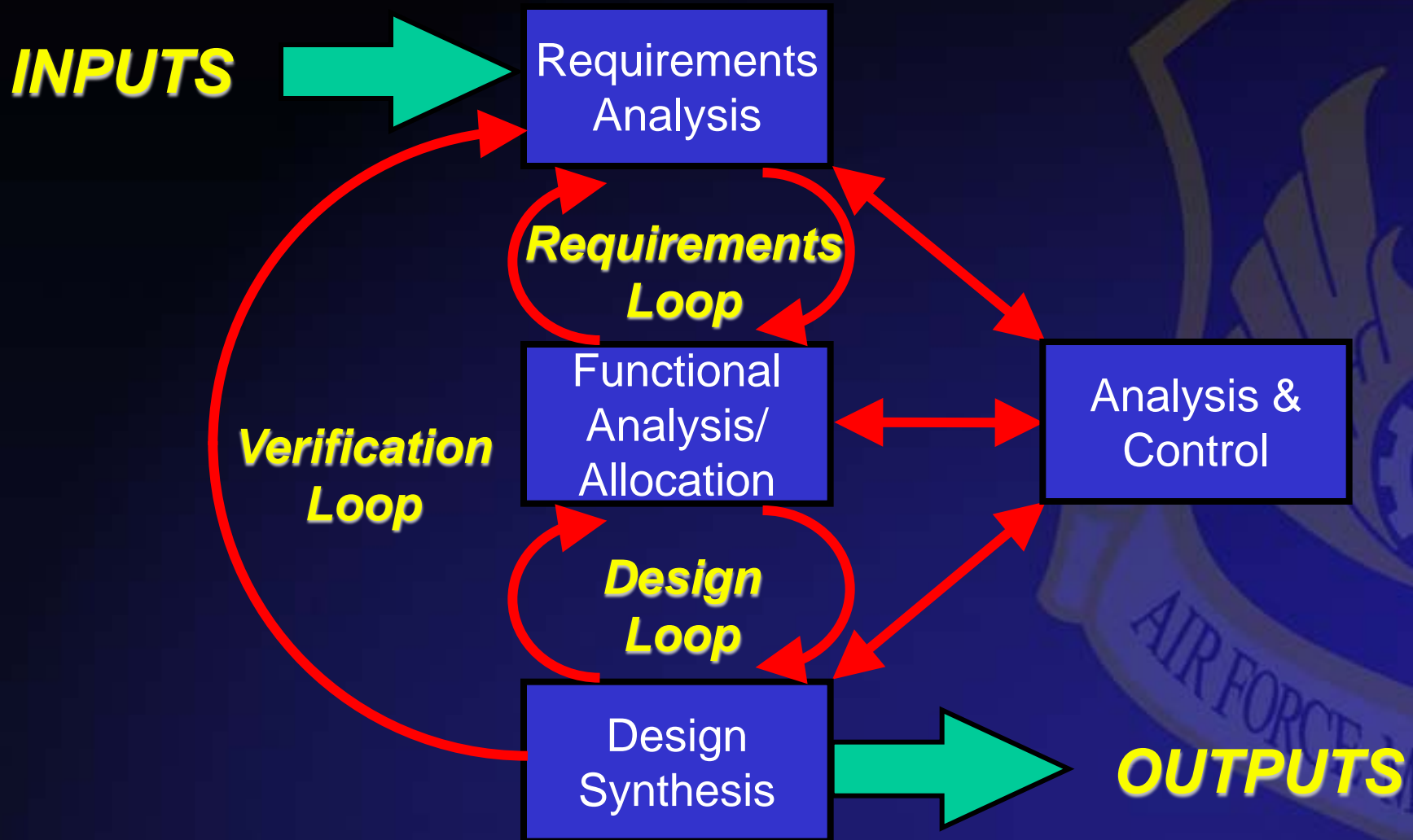- The workforce is certainly "problem independent", a "method", a "means" and "related to successful engineering"

- By any account, an organization's engineering workforce is one of the keys to successful systems engineering.

- Rather than the usual ad hoc, target-of-opportunity approach, an organization can apply a disciplined, methodical *systems engineering* approach to successfully develop the engineering workforce.

327th Aircraft Sustainment Wing Responsibilities

1382 Air Traffic Control & Landing Sys Mgd

1402 Aircraft Mgd (289 Inactive)

28,598 Engines Mgd 50 types

63 Weapon Systems 33 ATCALS

327 ASW

25 Commands

FY09 185 Program Depot Maintenance Completed

FY09 $3.9B Obligation Authority

$15.7B Contracts Managed In FY09

203 USAF Bases 42 FMS Nations

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Basic Systems Engineering Process

INPUTS

Requirements Analysis

Requirements Loop

Functional Analysis/ Allocation

Verification Loop

Design Loop

Analysis & Control

Design Synthesis

OUTPUTS

Input

- **334 Engineers in the 327 ASW**
- **Scattered across:**
  - **6 different organizational groups**
  - **19 different squadron/supervisors**
  - **30 different weapon systems**
- **Composed of:**
  - **6 different engineering disciplines**
  - **46 various years of experience**
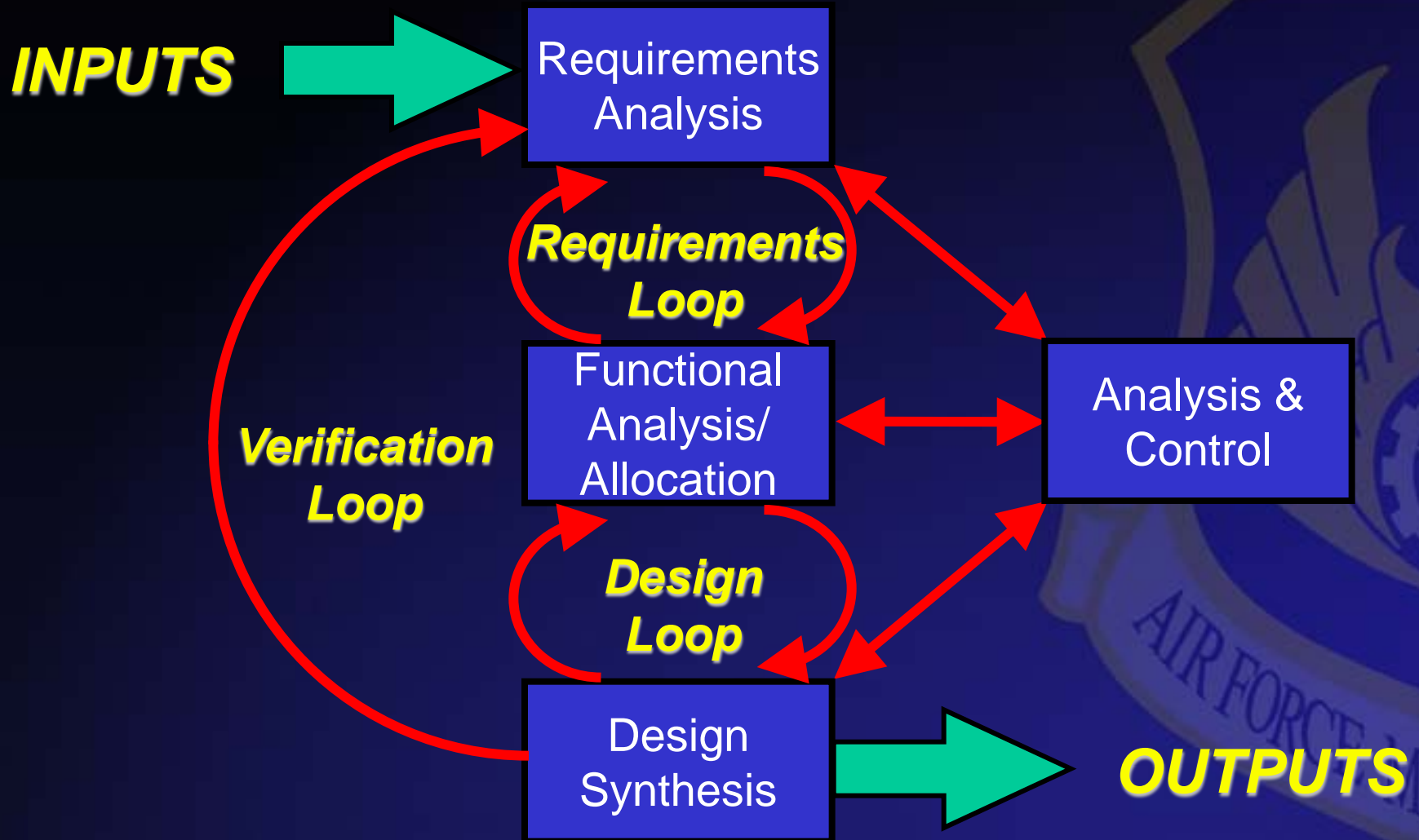 - **0 standardized, comprehensive development plans**

Requirements

- **Develop the 327 Aircraft Sustainment Wing's Engineering Workforce**
  - **All Inclusive………all engineers**
  - **Standardized……..consistent throughout org.'s**
  - **Comprehensive….covers all tenets of development**
  - **Individualized…….allows for individual needs**
  - **Repeatable………..new employees, each year**
 - **Measureable…..…for mngt & improvement**

Basic Systems Engineering Process

INPUTS → **Requirements Analysis**

Requirements Loop

Functional Analysis/ Allocation ↔ **Analysis & Control**

Verification Loop

Design Loop

**Design Synthesis** → **OUTPUTS**

Functional Analysis

- **Needed to breakdown what is meant by "Workforce Development"**
  - **Used the Requirements Loop process**
  - **Determined the components are:**
    - **Education**
    - **Professional Military Education (PME)**
    - **Acquisition Professional Development Program (APDP)**
    - **Career Broadening**
    - **Promotions**
    - **Awards**
    - **Training**

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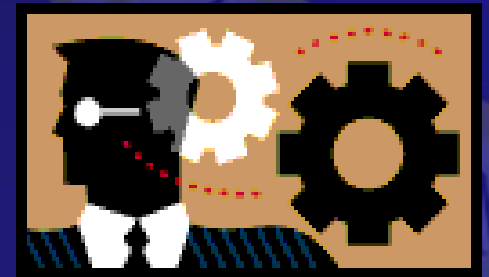
Basic Systems Engineering Process
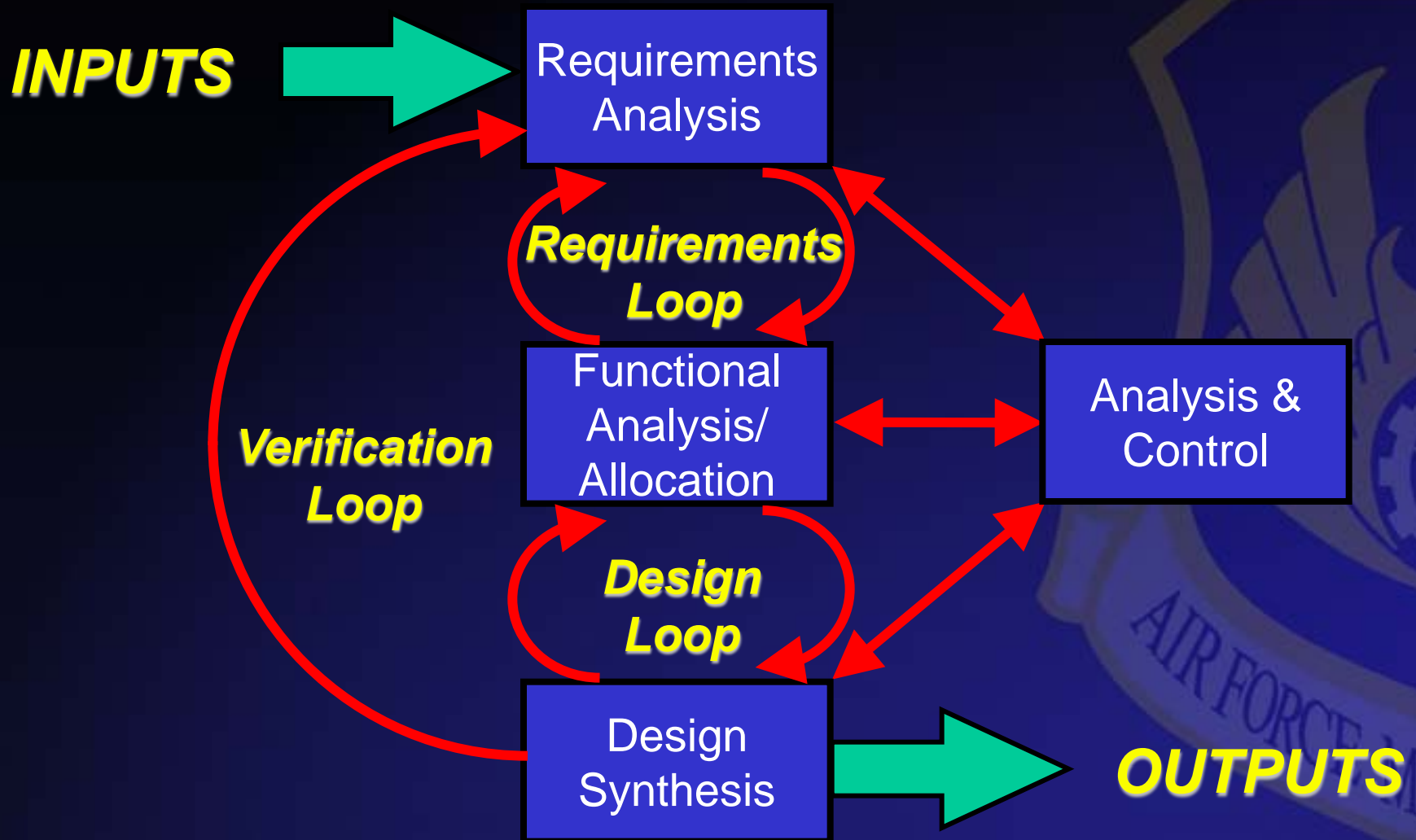
Design Loop

- **Recognized some systems exist**
  - **Did not cover all 7 components**
  - **Often not current**
  - **Difficult to use**
- **Needed simple means, to look at all components and whole org together**
  - **Spreadsheet (62 x 354)**
  - **Cumbersome, but will improve later…**
- **Horizontal for individual**
- **Vertical for organization**

Design: Personal Data

Name	Series	AFSC	Group	Squadron

- **Allows sorting by name and org**
- **Allows usage by supervisors**
- **Because all data is in one spot, very easy for employee and supervisor to verify data**

Design: Education Data

Have Masters?	Degree type	In Work	No

- **Everyone is in one of three categories: yes, no, in-work (because can take almost 2 years to complete and DP systems do not show "in-work")**

- **Degree Type filled only if "yes" or "in work"**

- **Post-degree work does not indicate currency**

Design: PME

BDE (SOS)	PME IDE (ACSC)	SDE (AWC)	In Work	None

- **Everyone is in one of three categories: yes, no, in-work (because can take almost 2 years to complete and DP systems do not show "in-work")**

- **Recently big push to have**

- **Employee should pursue "grade appropriate" PME level**

Design: APDP

Level I	APDP Level II	Level III	Acq Psn Career Level Rqd	APDP Cert Current

- **Several key issues:**
  - Do they have an APDP Certification
  - Are they in an Acq Coded job and what level?
  - Is employee current ?
  - Are they ready for "next level"?
- **Interesting note: found huge organizational gaps when compared**
  - Ex: org A at 95% acq coded, while org B is 34%

Design: Awards

Awards FY09	FY10	FY11

- **"Awards and Recognition" always cited in surveys as a top 3 problem area**
- **Unfortunately, tough to keep up with**
  - **Information has to be updated by awards monitors manually**
  - **Labor intensive effort**
  - **Looking for org trend**

Design: Career Broadening

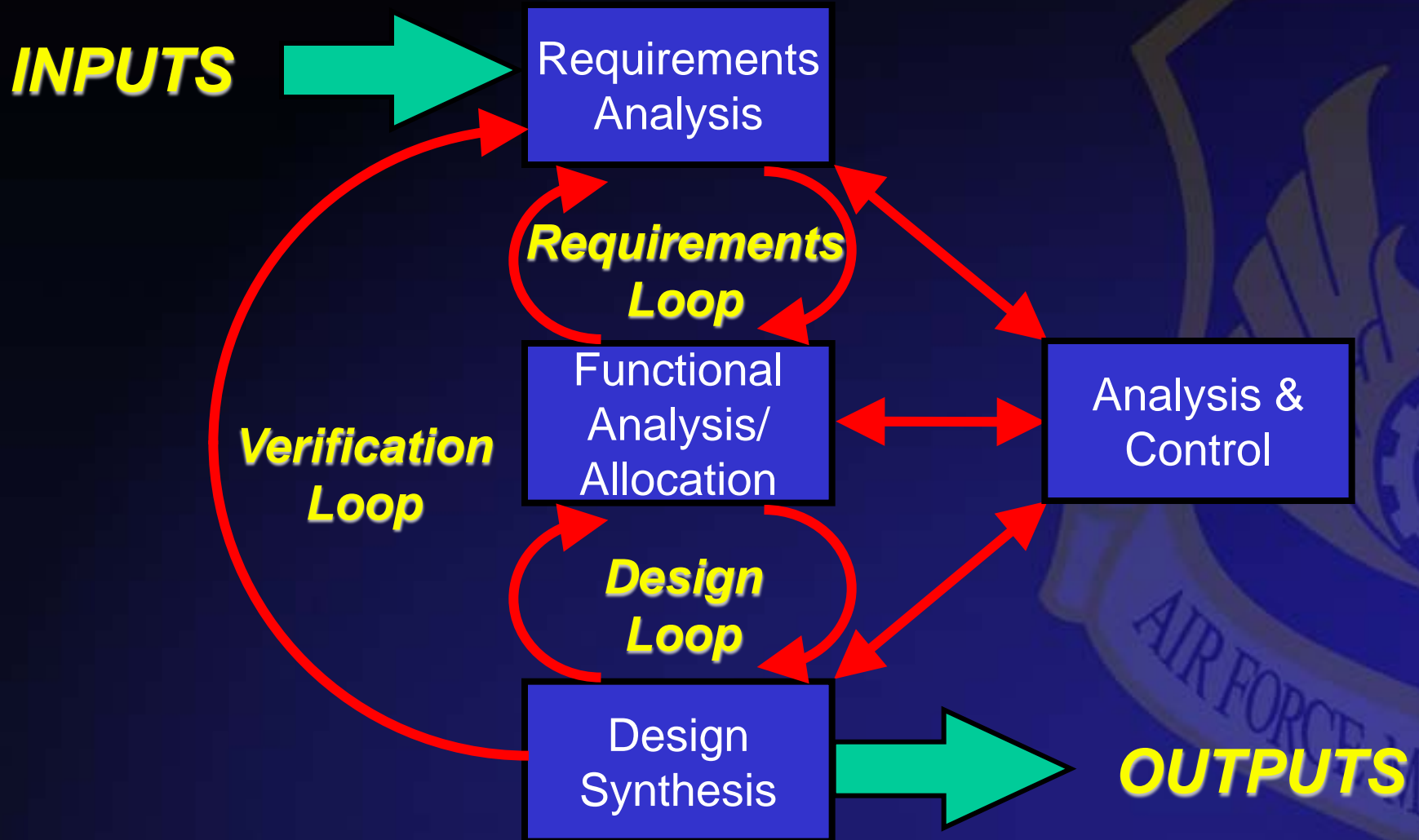| Career Broadening Done?	When?	Date Arrived in Current Job?	Employee Promoted?

- **Chief Engineer decides if Career Broadening vs just a move**
- **Date Arrived in Current Job is color indexed (cell is filled)**
  - **Green if <3 years**
  - **Yellow if >3 years but <5 years**
  - **Red if >5 years**
- **Promotions tracked separately**

Design: Continuous Learning

Year 1 Courses				Year 2 Courses				Year 3 Courses				Year 4 Courses	
SYS 182	SYS 155	SYS 028	SYS 165	SYS 172	SYS 116	CLE003	CLE009	SYS 161	SYS 138	SYS 185	CLC041	FPM101	CLE011

- **16 courses**
- **4 per year**
- **All CBT so no travel expenses**
  - **Minimize time away from job**
- **Once 16 completed, individualized training/specialization starts**

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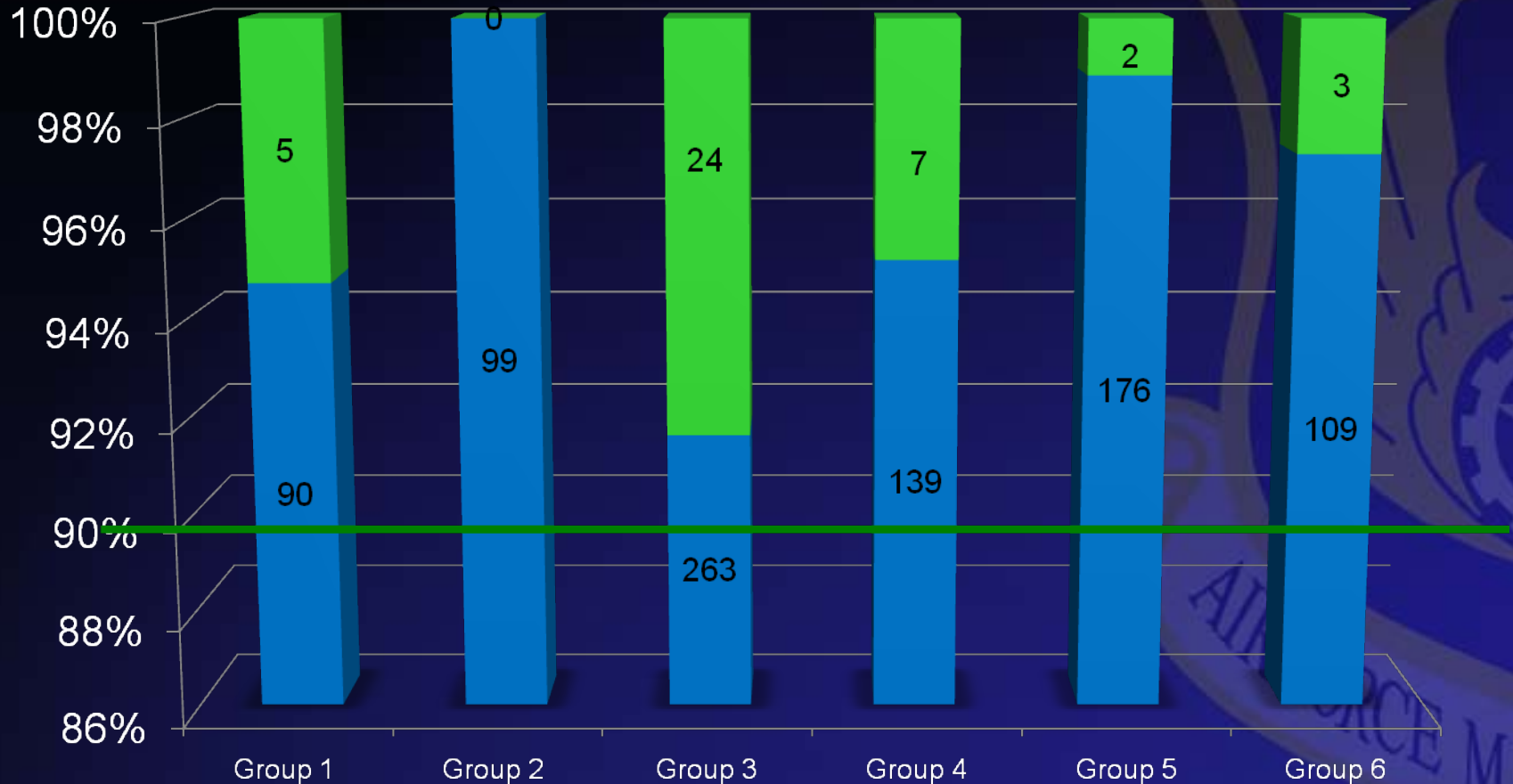
Design Synthesis → **OUTPUTS**

Analysis and Control

- **Several methods used for analysis and control:**
  - **Annual meeting to standardize/adjust entire program**
  - **Metrics for each all 7 components**
  - **Metrics for years to track trends**
  - **Metrics to compare organizations**
  - **Tool to be used by supervisor twice a year with employee**
  - **Metrics displayed to upper management at least quarterly**

Control Metric: 327ASW Training
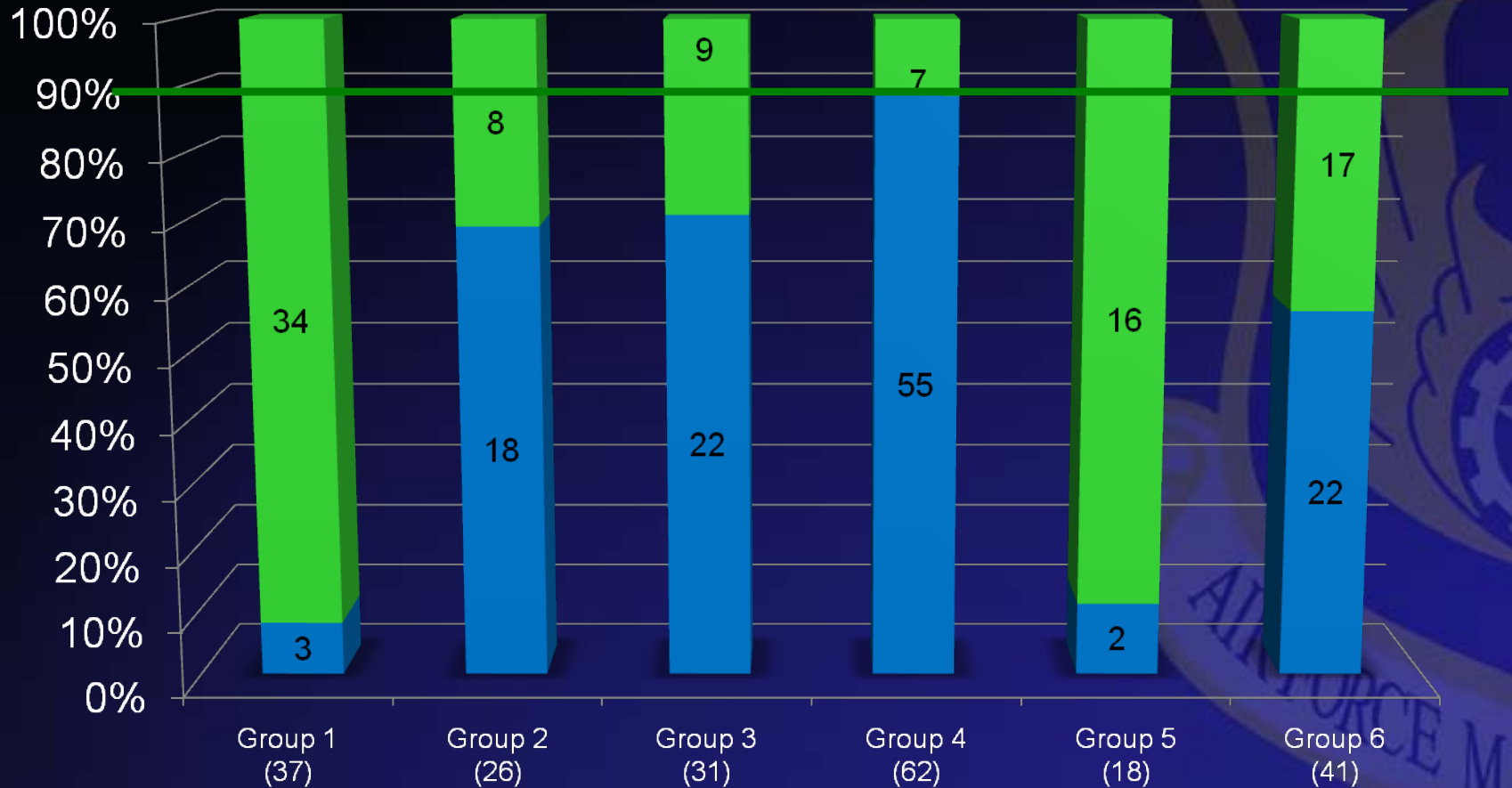
Personnel on Acquisition Coded Positions

327 ASW Goal 80%
Stretch Goal 90%

■ Classes Taken   ■ Classes Not Taken

Basic Systems Engineering Process
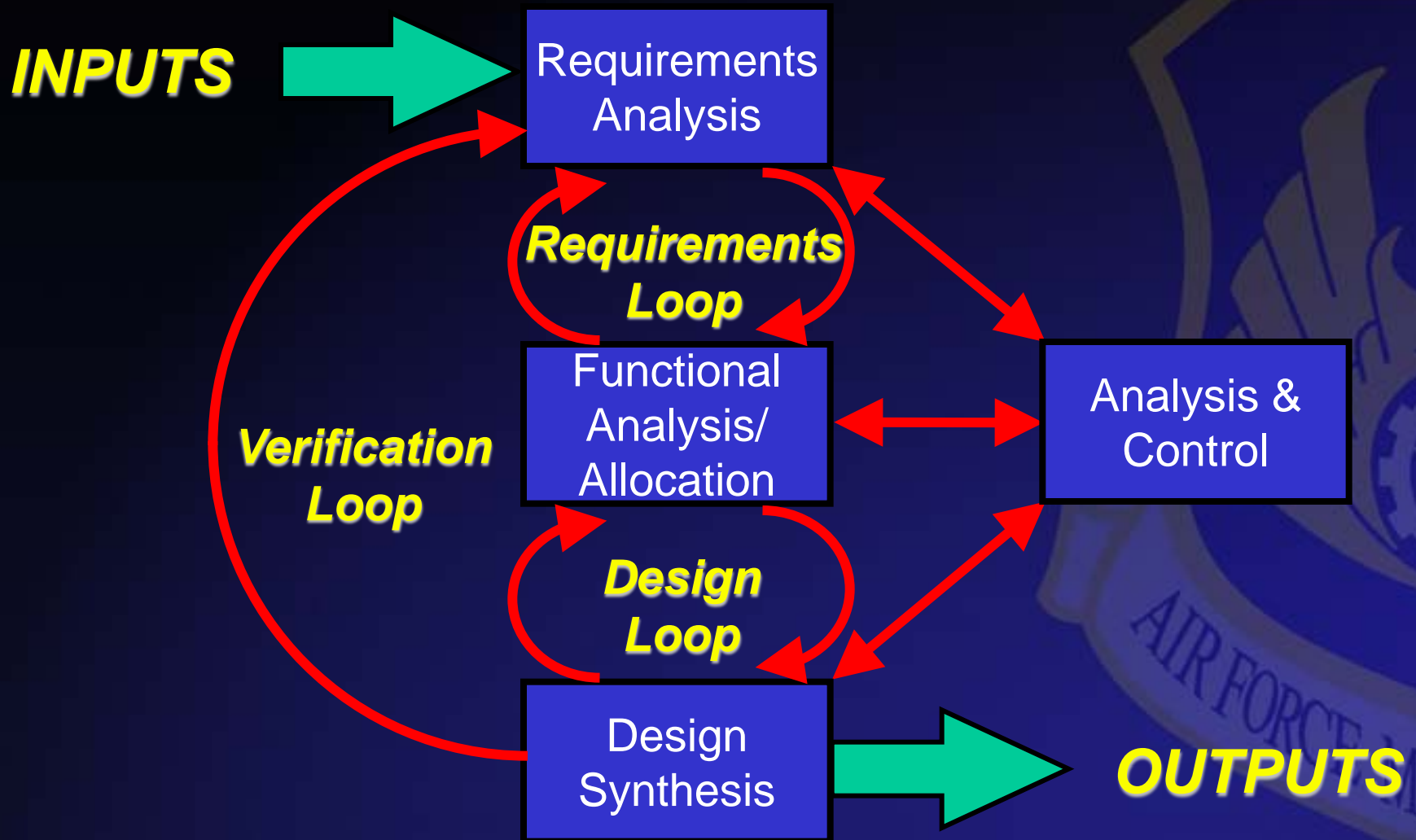

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Outputs

- **A trained, developed Workforce**

- **Workforce Development Plan provides:**
  - **Individualized attention**
  - **Standard baseline**
  - **Comprehensive look**
  - **Repeatable process**
  - **Measureable data**
  - **Monitored by upper management**

- **Example: ASW achieved 96% training goals for FY09**

Summary

- **327 ASW developed tangible systems engineering process/plan to develop the engineering workforce**

- **Clear-cut, tangible process**
  - **Will apply to 1300 ALC engineers in FY10**
  - **Plans to use for other disciplines (PM, loggies, etc…)**

- **Metrics to measure progress for management**

- **It works!**

In Place and In Use Now

Questions?

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