

# GRAND SYSTEMS DEVELOPMENT TRAINING PROGRAM

VERSION 12.0

The union of system engineering, domain engineering,  
functional management, and program management for  
the greater good of the enterprise and customer base.

## VOLUME 531 DIVISION 3 GRAND SYSTEMS SYNTHESIS QUARTER-BASED COURSE

Integration, optimization, and coordination of program  
product and process design with enterprise common  
process.

Student manual written by and course presented by  
Jeffrey O. Grady

**JOG** SYSTEM ENGINEERING, Inc. 

6015 Charae Street  
San Diego, California 92122  
(858) 458-0121

[jgrady@ucsd.edu](mailto:jgrady@ucsd.edu), or [jeff@jogse.com](mailto:jeff@jogse.com)  
<http://www.jogse.com>

© Copyright 2010

While subject to copyright the content of this student  
manual division may be copied freely.

This student manual Division 3 is coordinated with the content of CRC Press, a Taylor and Francis Company, book published under the title of “System Synthesis: Product and Process Design”. That textbook is thought of as Division 1 for the JOG System Engineering course “Grand Systems Synthesis”. Division 2 for that course is commonly supplied to students in paper form and it contains the presentation, workshop, and course administration materials. This Division 3 is available to students through download from the CRC Press website identified under the CRC Press catalog number K11032. Access is explained in the preface to the book. It contains supporting materials the reader and student will find useful in applying the content of the textbook to problems observed in their your company.

## TABLE OF CONTENTS

PARAGRAPH	TITLE	PAGE
1.	JOG System Engineering Grand Systems Development Training Program	1
2.	Data Rights Statement	1
3.	What Supporting Documents Are Available and Help In Accessing Them	2

### NOTE

Exhibits G through O offer templates for student workshop activity involving creating similar documents for class workshops. These exhibit may be included on a CD ROM. Exhibits G through J are normally included with the System Synthesis course and exhibits K through M with the Specialty Engineering Methods and Models course. Exhibits N and O are from the requirements course and included here for student convenience.

G	EXHIBIT G, Interface Control Document	
GA	EXHIBIT GA, Interface Control Document Template	GA-i
GB	EXHIBIT GB, Interface Control Document Data Item Description	GB-i
GC	EXHIBIT GC, Interface Control Document BADS Sample	GC-i
GD	EXHIBIT GD, Interface Control Document Zeus Space Transport System Sample	GD-i
GE	EXHIBIT GE, Interface Control Document Advanced Deployable System Sample	GE-i
H	EXHIBIT H, Trade Study Report	
HA	EXHIBIT HA, Trade Study Report Template	HA-i
HB	EXHIBIT HB, Trade Study Report Data Item Description	HB-i
HC	EXHIBIT HC, Trade Study Report BADS Sample	HC-i
HD	EXHIBIT HD, Trade Study Report Zeus Space Transport System Sample	HD-i
HE	EXHIBIT HE, Trade Study Report Advanced Deployable System Sample	HE-i
I	EXHIBIT I, Design Concept Record	
IA	EXHIBIT IA, Design Concept Record Template	IA-i
IB	EXHIBIT IB, Design Concept Record Data Item Description	IB-i
IC	EXHIBIT IC, Design Concept Record Template BADS Sample	IC-i
ID	EXHIBIT ID, Design Concept Record Zeus Space Transport System Sample	ID-i
IE	EXHIBIT IE, Design Concept Record Template Advanced Deployable System Sample	IE-i

## TABLE OF CONTENTS

PARAGRAPH	TITLE	PAGE
J	EXHIBIT J, Design Review Documents	
JA	EXHIBIT JA, Design Review Documents Template	JA-i
JB	EXHIBIT JB, Design Review Documents Data Item Description	JB-i
JC	EXHIBIT JC, Design Review Documents BADS Sample	JC-i
JD	EXHIBIT JD, Design Review Documents Zeus Space Transport System Sample	JD-i
JE	EXHIBIT JE, Design Review Documents Advanced Deployable System Sample	JE-i
K	EXHIBIT K, RAM AAA Report	
KA	EXHIBIT KA, RAM AAA Report Template	KA-i
KB	EXHIBIT KB, RAM AAA Report Data Item Description	KB-i
KC	EXHIBIT KC, RAM AAA Report BADS Sample	KC-i
KD	EXHIBIT KD, RAM AAA Report Zeus Space Transport System Sample	KD-i
KE	EXHIBIT KE, RAM AAA Report Advanced Deployable System Sample	KE-i
L	EXHIBIT L, Safety Hazard Analysis Report	
LA	EXHIBIT LA, Safety Hazard Analysis Report Template	LA-i
LB	EXHIBIT LB, Safety Hazard Analysis Report Data Item Description	LB-i
LC	EXHIBIT LC, Safety Hazard Analysis Report BADS Sample	LC-i
LD	EXHIBIT LD, Safety Hazard Analysis Report Zeus Space Transport System Sample	LD-i
LE	EXHIBIT LE, Safety Hazard Analysis Report Advanced Deployable System Sample	LE-i
M	EXHIBIT M, Mass Properties Report	
MA	EXHIBIT MA, Mass Properties Report Template	MA-i
MB	EXHIBIT MB, Mass Properties Report Data Item Description	MB-i
MC	EXHIBIT MC, Mass Properties Report BADS Sample	MC-i
MD	EXHIBIT MD, Mass Properties Report Zeus Space Transport System Sample	MD-i
ME	EXHIBIT ME, Mass Properties Report Advanced Deployable System Sample	ME-i
N	EXHIBIT N, System Definition Document	
NC	EXHIBIT NC, BADS System Definition Document	NC-i
O	EXHIBIT O, Item Specifications	
OCA	EXHIBIT OCA, BADS Sample Item Performance Specification	OCA-i
OCB	EXHIBIT OCB, BADS Sample Item Detail Specification	OCB-i

## LIST OF ILLUSTRATIONS

FIGURE	TITLE	PAGE
1	Division 3 Document Status	5



JOG SYSTEM ENGINEERING, INC.  
GRAND SYSTEMS SYNTHESIS COURSE  
STUDENT MANUAL DIVISION 3  
SUPPORTING DOCUMENTS

1. JOG System Engineering Grand Systems Development Training Program

This course is one of four courses in a certificate program that covers the complete system development life cycle from customer recognition of a need that they must have fulfilled through completion of system test and evaluation and the beginning of delivery of the system to the customer. These four courses were packaged recognizing that system engineers contribute to the system development process in essentially four major ways: (1) we define problems to be solved through the preparation of good specifications crafted using structured analysis modeling, (2) we provide integration and optimization skills during the synthesis process during which the design to solve the problem stated in the specifications is accomplished, materials identified in engineering drawings and parts lists are acquired through procurement, and manufactured and assembled into deliverable products, (3) we support the verification process through which developers establish proof of the degree of agreement between the content of the specifications and the finished product, and (4) we support management efforts to provide effective management of a program during the other three activities across the development life cycle.

The following four courses align with these four fundamental program life cycle activities:

- |                              |                              |
|------------------------------|------------------------------|
| 1 Grand Systems Management   | 3 Grand Systems Synthesis    |
| 2 Grand Systems Requirements | 4 Grand Systems Verification |

The term grand in the titles relates to a theme applied throughout the program that product systems are created by program systems contained within enterprise systems and that program systems must respond to their contractual commitments while integrating and optimizing at the true system level that embraces both the product and corresponding process elements of the system. The enterprise that is insisting on its programs integrating and optimizing at the true system level and applies the same principles in managing its several programs is said by the owner of JOG System Engineering to be practicing grand systems development. These courses are all available through JOG System Engineering for commercial purchase and delivery anywhere in the world.

2. Data Rights Statement

The data in this student manual division is the property of JOG System Engineering, Inc located at 6015 Charae Street, San Diego, CA 92122, USA that can be contacted via [jgrady@jogse.com](mailto:jgrady@jogse.com) or (858) 458-0121 and is copywrite protected. However, students taking courses offered by JOG System Engineering may copy, edit, print and treat these documents as their own property as soon as any content is altered. Persons other than students of JOG System Engineering courses in possession of this data may also employ this data in ways of their choosing. Some of the exhibits included in this student manual division may be under development at the time that you gain access. The contents of the student manual Division 3 at any moment reflects the current state of

the available data. The division may include data related to sample systems that were not stressed or selected for use in your course workshops because of the client company served or the student population in the class. Refer to Figure 1 for current status. There may also be voids where documents identified in the division table of contents are planned but not yet included. Anyone in possession of the data included in the JOG System Engineering Synthesis course student manual Division 3 may consider that this document provides you with written permission to copy and edit the data contained in Division 3. This permission does not extend to content of course Division 1 (text) or Division 2 (presentation materials) that may not be copied without separate written authorization from the publisher or the owner of JOG System Engineering, Inc. respectively.

### 3. What Supporting Documents Are Available and Help In Accessing Them

Student manual Division 1 is provided by student purchase of the textbook System Synthesis authored by Jeffrey O. Grady and published by CRC Press. Copies of the book are commonly available only from Amazon or any technical bookstore. Prior to publication of the book JOG System Engineering will make manuscript copies available to organizations purchasing the course.

Student manual Division 2 is provided by JOG System Engineering to all students either through the institution purchasing the course from JOG System Engineering or a university bookstore. It contains all of the presentation materials, workshop materials, and administrative data including a map between the course periods and textbook chapters in Exhibits A, B, and C respectively. The content of Division 2 is protected under copywrite by JOG System Engineering. Exhibits D, E, and F are voids for this course.

Student manual division 3 contains supporting data provided to you on a CD or made available on a web site for your selective download. It consists of Exhibits G, H, I, J, K, L, M, N, and O. Each one of these exhibits includes one or more documents in three subordinate variations: (A) a template document with a paragraphing structure but no content, (B) a data item description (DID) providing instructions for creating a real program document using the corresponding template, and (C) a sample document developed for a program called the battlefield attack data system (BADS), a fictional system employing a droned Harrier AV-8B as an uninhabited combat air vehicle (UCAV). The Division may contain other subordinate exhibits beyond C that correspond to sample systems other than BADS as listed below where X is the Exhibit letter from the set {G, H, I, J, K, L, M, N, O}. All of these systems are intended to be fictional systems but the Zeus in Exhibit XD, for example, is largely based on a General Dynamics Atlas Centaur launch vehicle, the target system is based on a high altitude high speed target (Firebolt) developed by Teledyne Ryan Aeronautical, and the BADS uses a real Boeing Harrier AV-8B but to the knowledge of the owner of JOG System Engineering, that aircraft has not been droned for these purposes.

XC	Battlefield Attack Data System (BADS)
XD	Zeus Space Transport System
XE	Advanced Deployable System (ADS)
XF	Target System



XG	Flight Simulator Trainer
XH	Combat Air Control System
XI	Capitol Equipment Corporation Farm Tractor
XJ	Capitol Equipment Corporation Bulldozer
XK	Sea Dragon Submarine
XL	Rail Transport System
XM	Hurricane Alert Satellite System
XN	Double Eagle Truck System

The JOG System Engineering course ID for this course is 521 so all of the file names are preceded by this designator followed by the numeral 3 to designate division 3. The top-level Exhibit designators for this course are further partitioned to recognize three kinds of documents in Exhibits G and H and two kinds in Exhibit M and O. Exhibits N and O are actually included from the requirements course as a convenience to students taking the synthesis course who did not take the requirements course or who did not save Division 3 from that course.

The gaps after 5213GE, HE, IE, JE, KE, LE, and ME in the listing indicate possible exhibits for other systems not listed here that may be included as folders for 5213XD through 5313XN where X is the Exhibit letter from the set {G, H, I, J, K, L, M} and D through N are the specific sample system designators listed above. Some of these exhibits may be populated at the time of your interest in this data.

5213G	Exhibit G, Interface Control Document
5213GA	Exhibit GA, Interface Control Document Template
5213GB	Exhibit GB, Interface Control Document Data Item Description
5213GC	Exhibit GC, Interface Control Document BADS Sample
5213GD	Exhibit GD, Interface Control Document Zeus Space Transport System Sample
5213GE	Exhibit GE, Interface Control Document Advanced Deployable System Sample
5213H	Exhibit H, Trade Study Report
5213HA	Exhibit HA, Trade Study Report Template
5213HB	Exhibit HB, Trade Study Report Data Item Description
5213HC	Exhibit HC, Trade Study Report BADS Sample
5213HD	Exhibit HD, Trade Study Report Zeus Space Transport System Sample
5213HE	Exhibit HE, Trade Study Report Advanced Deployable System Sample
5213I	Exhibit I, Design Concept Record
5213IA	Exhibit IA, Design Concept Record Template
5213IB	Exhibit IB, Design Concept Record Data Item Description
5213IC	Exhibit IC, Design Concept Record Template BADS Sample
5213ID	Exhibit ID, Design Concept Record Zeus Space Transport System Sample
5213IE	Exhibit IE, Design Concept Record Template Advanced Deployable System Sample
5213J	Exhibit J, Design Review Documents
5213JA	Exhibit JA, Design Review Documents Template
5213JB	Exhibit JB, Design Review Documents Data Item Description

5213JC	Exhibit JC, Design Review Documents BADS Sample
5213JD	Exhibit JD, Design Review Documents Zeus Space Transport System Sample
5213JE	Exhibit JE, Design Review Documents Advanced Deployable System Sample
5213K	Exhibit K, RAM AAA Report
5213KA	Exhibit KA, RAM AAA Report Template
5213KB	Exhibit KB, Ram AAA Report Data Item Description
5213KC	Exhibit KC, RAM AAA Report BADS Sample
5213KD	Exhibit KD, RAM AAA Report Zeus Space Transport System Sample
5213KE	Exhibit KE, RAM AAA Report Advanced Deployable System Sample
5213L	Exhibit L, Safety Hazard Analysis Report
5213LA	Exhibit LA, Safety Hazard Analysis Report Template
5213LB	Exhibit LB, Safety Hazard Analysis Report Data Item Description
5213LC	Exhibit LC, Safety Hazard Analysis Report BADS Sample
5213LD	Exhibit LD, Safety Hazard Analysis Report Zeus Space Transport System Sample
5213LE	Exhibit LE, Safety Hazard Analysis Report Advanced Deployable System Sample
5213M	Exhibit M, Mass Properties Report
5213MA	Exhibit MA, Mass Properties Report Template
5213MB	Exhibit MB, Mass Properties Report Data Item Description
5213MC	Exhibit MC, Mass Properties Report BADS Sample
5213MD	Exhibit MD, Mass Properties Report Zeus Space Transport System Sample
5213ME	Exhibit ME, Mass Properties Report Advanced Deployable System Sample
5213N	Exhibit N, System Definition Document
5213NC	Exhibit NC, BADS System Definition Document
5213O	Exhibit O, Item Specifications
5213OCA	Exhibit OCA, BADS Sample Item Performance Specification
5213OCB	Exhibit OCB, BADS Sample Item Detail Specification

The files generally were created in Microsoft Office applications on a Macintosh computer but it should be possible to open them using a Windows machine with Office applications. Some of the graphics files that may be included were developed using an apple graphics package and it will not be possible to open those on a windows machine. In all cases, these files were cut and pasted into Microsoft Word documents included in the Division that can be opened with a Windows machine. The file extensions employed are as follows (with the operating systems applicable indicated in parenthesis):

CD	Claris Draw (Macintosh Only)
CI	Claris Impact (Macintosh Only)
DOC/DOCX	Microsoft Word (Macintosh or Windows)
EXDRAW	EazyDraw (Macintosh)
PPT/PPTX	Microsoft Powerpoint (Macintosh or Windows)

#### 4. Status of Division 3 Content

Figure 1 provides a status report of the current content of this Division. These listed documents will appear in a paper Division 3 provided to students or available for student download from the publisher's website or <http://www.jogse.com>.

		A		B		C		D		E	
INTERFACE CONTROL DOCUMENT	G	A	B	A	B	A	B	A	B	A	B
A HARDWARE											
B SOFTWARE											
TRADE STUDY REPORT	H										
DESIGN CONCEPT RECORD	I										
DESIGN REVIEW DOCUMENTS	J										
RAM AAA REPORT	K										
SAFETY HAZARD ANALYSIS	L										
MASS PROPERTIES REPORT	M										
BADS SDD	N										
BADS SPECIFICATION SAMPLES	O										
A PERFORMANCE											
B DETAIL											

CROSS-HATCHED  
CLEAR

PROVIDED  
NOT CURRENTLY AVAILABLE

Figure 1 Division 3 Document Status

