

Standardization training program E-60 discipline: Control

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- 14:00 -14:10: **E60 overview**
Alain Benoit (TEC-EC)
- 14:10 -14:30: **Control engineering handbook** (ECSS-E-HB-60A)
Alain Benoit (TEC-EC)
- 14:30 -15:10: **Control performance and ESA Pointing Error Engineering Handbook** (ECSS-E-ST-60-10C and ESSB-HB-E-003)
Massimo Casasco (TEC-ECN)
- 15:10 -15:30: COFFEE BREAK
- 15:30 -15:50: **Star sensor terminology and performance specification** (ECSS-E-ST-60-20C Rev. 1)
Steeve Kowaltschek (TEC-ECC)
- 15:50 -16:30: **Satellite AOCS Requirements** (ECSS-E-HB-60-30A):
Sohrab Salehi (TEC-ECN)
- 16:30 -17:00: Final Discussion

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Overview

- E60 branch was conceived as engineering standards and handbooks for **all systems involving control** (i.e. “feedback control” including e.g. thermal control, but not “ground control”)
 - a **satellite** (e.g. w.r.t. its attitude and orbit control, or w.r.t. active thermal control) or a cluster of satellites;
 - a space **vehicle during RVD or EDLS**
 - a **launcher rocket**;
 - a **pointing system**; a **robot arm system**, a **rover**;
 - an automated **payload or laboratory facility**;
 - **any other technical system** involving control.
- Consequently, high level documents are quite generic
 - Control engineering Handbook, Control performance Standard
- Lower level documents are specific to AOCS or to Pointing Engineering
 - AOCS Requirements, Star Sensor, Gyros
 - ESA Pointing Error Engineering Handbook,

Examples of non space control systems

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- Heating system

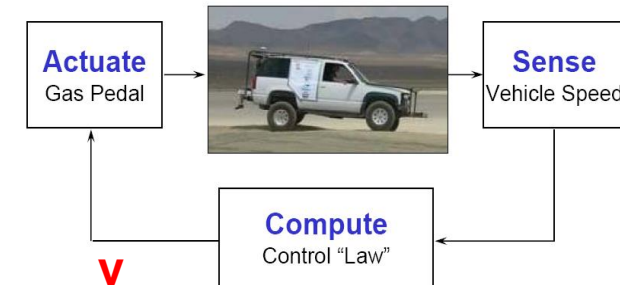
- Plant: room
Output controlled : temperature
Controller: heating system e.g. thermostat



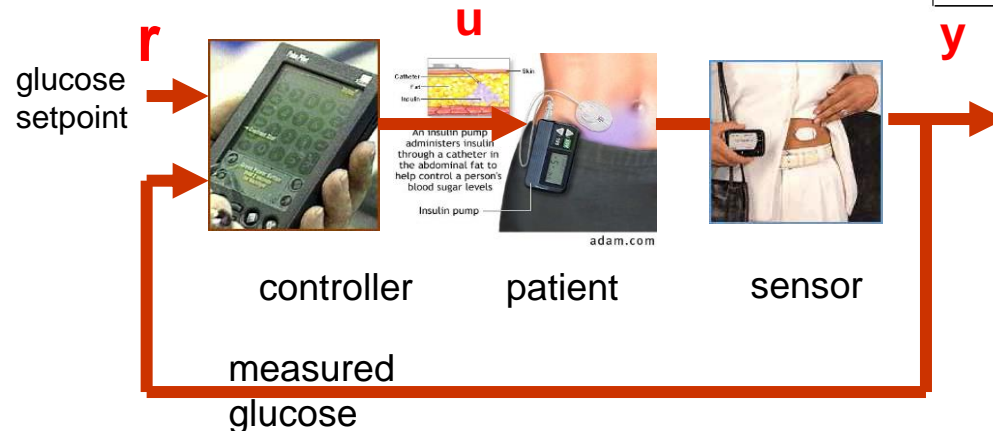
(Honeywell, 1953)

- Car cruise control

- Plant: car
Output controlled : velocity
Controller: driver or automatic cruise control system



- Glucose control



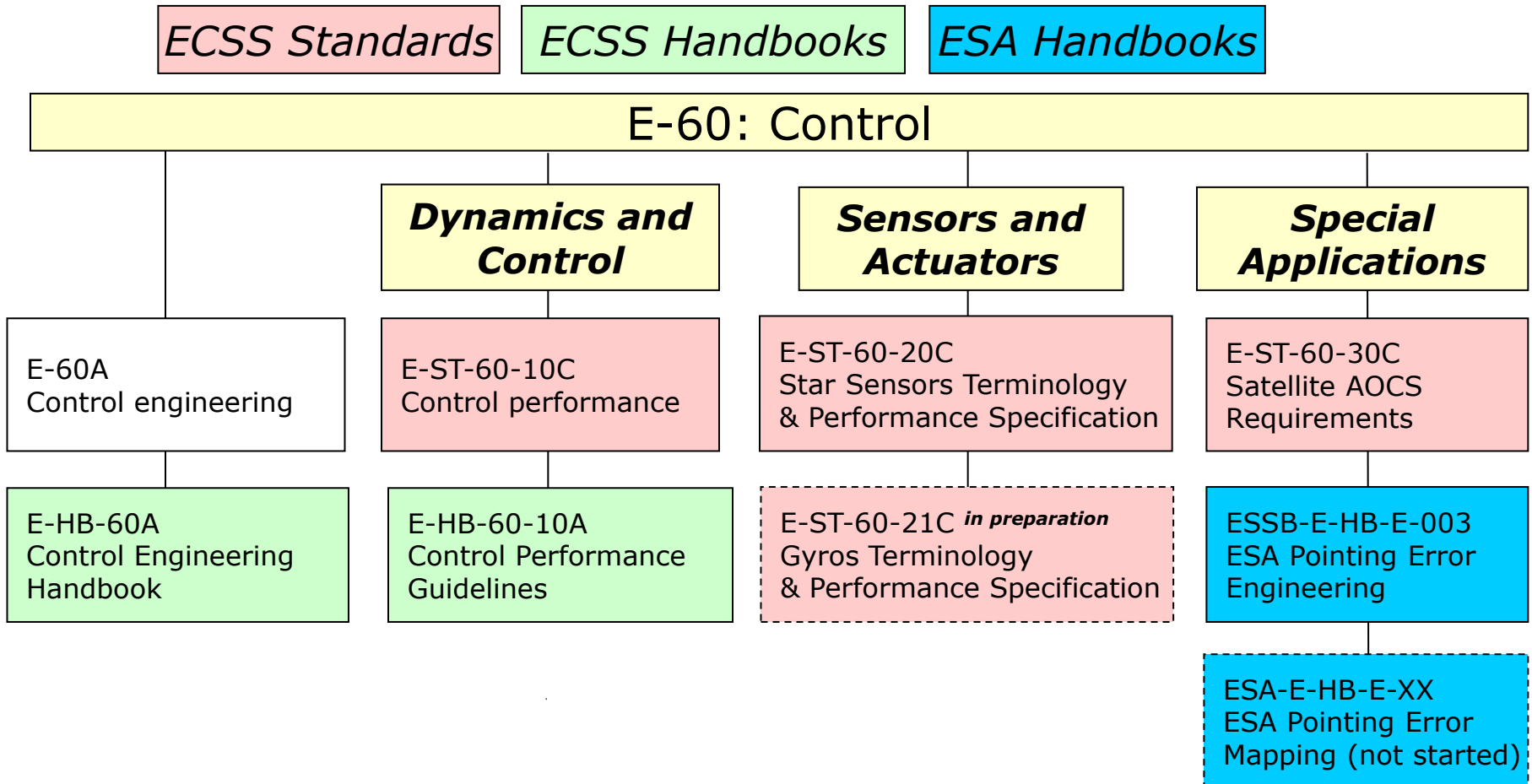
ECSS-E60 history

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WG	Document	comments
ECSS WG 1 (2001-2004)	Control Engineering (Sept 2004)	<ul style="list-style-type: none"> • Level 2 document originally published as a standard • Introduces the control terminology • ECSS Task Force 2 did not recognize it as a standard (addressing engineering process rather than requirements) • Its normative DRD's will be covered by the Satellite AOCS requirements Standard
No WG	Control Engineering Handbook (Dec 2010)	<ul style="list-style-type: none"> • Adapted from the level 2 original standard by the E60 Discipline Convenor
ECSS WG 2 (2005-2007)	Star Sensors Terminology and Performance Specification Standard (Nov 2008)	<ul style="list-style-type: none"> • Objective was to harmonise STR terminology and performance metrics • It suffered from the slow progress of // Control Performance WG
ECSS WG 3 (2005-2008)	Control Performance Standard (Nov 2008)	<ul style="list-style-type: none"> • Original draft was much bigger. WG was requested to derive a short standard addressing stability (intrinsic) and performance error (extrinsic)
No WG	Control Performance Guidelines (Dec 2010)	<ul style="list-style-type: none"> • Adapted from the original draft above by the WG3 convenor, as a Handbook (210 pages) for control engineers (no public review)
ESA TEC-EC and NPI (2008-2011)	ESA Pointing Error Engineering Handbook (July 2011)	<ul style="list-style-type: none"> • Objective was to specifically address Satellite Pointing Errors and clearly guide the error budget engineering process
ECSS WG 4 (2007-2011)	Satellite AOCS requirements Standard (August 2013)	<ul style="list-style-type: none"> • Standard set of AOCS requirements for satellites: <ul style="list-style-type: none"> - input for ESA MRD/SRD - normative requirements and documentation related to AOCS design and verification all along the satellite development
ECSS WG 5 (2012-2014)	Gyro Terminology and Performance Specification Standard (not published)	<ul style="list-style-type: none"> • Started 4Q2012 • Public Review 2015

The ECSS E60 branch

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Contact points

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