2. (a) i. $\Pi_{eid}(\sigma_{aname="Boeing"}(Aircraft \bowtie Certified))$

ii. $\Pi_{ename}(\sigma_{aname="Boeing"}(Aircraft \bowtie Certified \bowtie Employees))$

iii. $\Pi_{aid}(\sigma_{cruisingrange>distance}(Aircraft \times \sigma_{from="Bonn" \wedge to="Madrid"}(Flights)))$

iv. $\Pi_{flno}(\sigma_{cruisingrange>distance}((\sigma_{salary \geq 100000}(Employees) \bowtie Certified \bowtie Aircraft) \times Flights))$

v. $R_1 := \Pi_{eid}(\sigma_{cruisingrange>3000}(Aircraft \bowtie Certified)) - \Pi_{eid}(\sigma_{aname="Boeing"}(Aircraft \bowtie Certified))$
$\pi_{ename}(Employees \bowtie R_1)$

vi. $\rho_{\alpha}(Employees)$
$\Pi_{eid}(Employees) - \Pi_{eid}(\sigma_{Employees.salary<\alpha.salary}(Employees \times \alpha))$

vii. $\rho_{\alpha}(Employees)$
$\rho_{MAX}(\Pi_{eid}(Employees) - \Pi_{eid}(\sigma_{Employees.salary<\alpha.salary}(Employees \times \alpha)))$
$\rho_{\beta}(Employees - MAX)$
$\rho_{\gamma}(\beta)$
$\Pi_{eid}(\beta) - \Pi_{eid}(\sigma_{\beta.salary<\gamma.salary}(\beta \times \gamma))$

viii. We need to know the number of air crafts, and the number of air crafts is not an attribute in any of the relations, thus we need to count it. Counting can't be done with relational algebra. It can be done with SQL though.

ix. $\rho_{\alpha}(Certified)$
$\rho_{\beta}(Certified)$
$\rho_{\gamma}(Certified)$
$\rho_{\theta}(\alpha \times \beta \times \gamma)$
$\rho_{\lambda}(\theta \times Certified)$
$\sigma_{\alpha.eid=\beta.eid=\gamma.eid \wedge \alpha.aid \neq \beta.aid \neq \gamma.aid}(\theta) - \sigma_{\alpha.eid=\beta.eid=\gamma.eid=Certified.eid \wedge \alpha.aid \neq \beta.aid \neq \gamma.aid \neq Certified.aid}(\lambda)$

x. Since we need to add up values, it is not possible with relational algebra.